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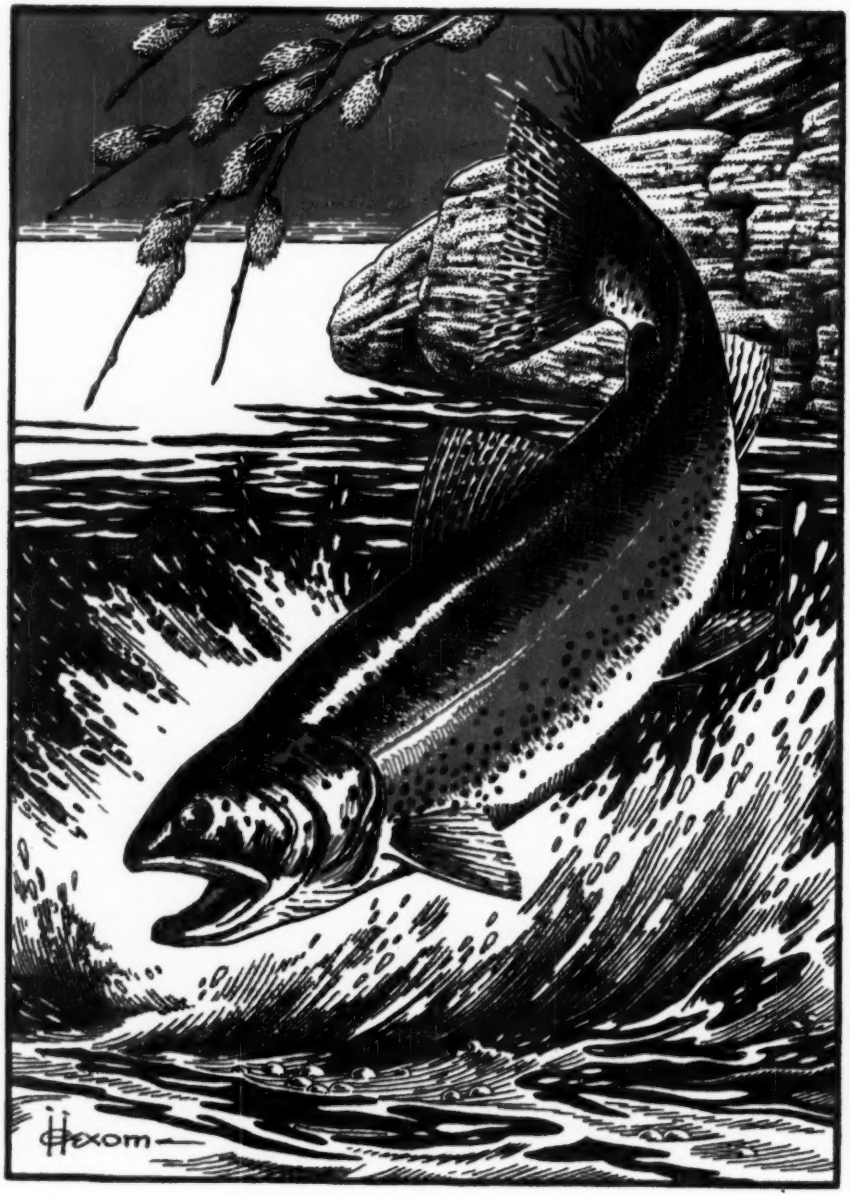

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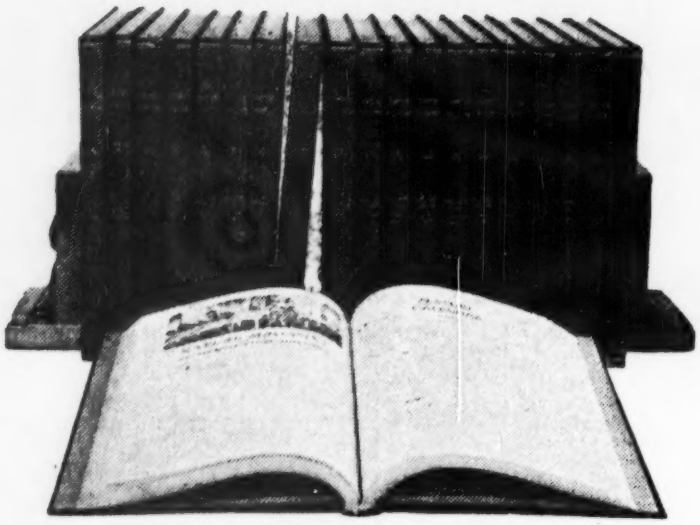

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LINKHORN BAY

By Louisa Venable Kyle

THOSE who visit Princess Anne County and Virginia Beach during Historic Garden Week in Virginia will find some of the most beautiful homes in the Virginia Beach area located on Linkhorn Bay, with its pine-crested bluffs and quiet coves. It is a sheltered, brackish body of water with little visible rise and fall of tide, except when severe storms or hurricanes fill it with an abnormal supply of sea water. There are many fresh-water springs in the bay, and their location is visible on the rare occasions when, in bitter cold winters, the bay has been locked in ice. Crabs, fishes and oysters are plentiful. Wild geese and ducks rest on its surface during the migratory seasons.

Linkhorn Bay, where four of the houses on the Virginia Beach Tour will be open during Historic Garden Week, is rich in history and legend, for Indians once paddled around its shores and hunted and fished from dugout canoes. In the days following the landing of the Cavaliers at Cape Henry in April, 1607, Captain John Smith, George Percy, Bartholemew Gosnold and other members of the party took a small skiff and explored the rivers and bays behind Cape Henry. Seeing this lovely place, with dogwood and Judas trees in bloom, with yellow jessamine cascading over pine trees, and with the tender green of spring reflected in its waters, it is small wonder that the English explorers wrote home, "God never fashioned a better place for man's habitat."

There is a legend that Black Beard, the pirate, used the bays behind Virginia Beach as a hideout, but so far as is known none of his treasure has as yet been unearthed. The name itself creates interest, and maps of the locality made during the Revolution list it as Linckhorn Bay. Some say that the name comes from the fact that it links on to another large inland bay, called Broad Bay. There is a narrow strait called "the Narrows" that connects the two bodies of water. Others look at the map and see an imaginary picture of linked horns formed by an indented peninsula that divides the southern end of this body of water into two parts. While the shoreline around this land is so irregular as to cause a map picture of horns, the peninsula itself resembles the neck of a bird and bears the name Bird Neck Point.

The land on the western shore of Linkhorn Bay is now being changed from farm land into residential property, but for generations it remained in the same family, being land that was originally granted to the Woodhouse family by the King in 1637. The southern part of the bay is crossed by two highway bridges on Route 164, just before it enters Virginia Beach at 31st Street. The eastern shore of Linkhorn Bay has the most beautiful residential sections of Virginia Beach along its coves. The greens of the Princess Anne Country Club come to the water's edge at several places. Bay Colony and Linkhorn Park are sections of the beach where houses will be open during Garden Week.

Only the northern shore of Linkhorn Bay has been and will be spared the march of progress. This belongs to the Seashore State Park, and in this wilderness there are trees hung with Spanish moss, old silvered trunks of cedar and cypress. Ospreys nest in tall pines, blue herons wade sedately along the shore, and this is how the Redman saw this beautiful inland bay.

Hunting for Education

My Way of Becoming a Hunter. By Robert H. Rockwell, with Jeanne Rockwell. New York. 1955. W. W. Norton and Company. 285 pages. Illustrated. $3.75.

Robert Rockwell's career in taxidermy started in a grubby shop in downtown New York when he was sixteen. There he learned methods, but constantly felt the need of doing something better than the strictly commercial work, without concern for scientific accuracy, that his German employer turned out. When a fellow employee suggested that the young man try for employment with Ward's Natural Science Establishment in Rochester, New York, he did so. He got a position there, and that opened the door for a career in taxidermy and museum preparation that led successively to work with the National Museum in Washington, the Brooklyn Museum, and, finally, the American Museum of Natural History in New York. In 1926 he went to Africa with Carl Akeley on the first collecting trip that was to result in the great African habitat groups at the Museum. This book is the story of collecting for the Museum and the subsequent preparation of the exhibits.

Book of Beasts

The Book of Beasts. By T. H. White. New York. 1955. G. P. Putnam's Sons. 296 pages. $5.00.

This is a fascinating translation of a medieval bestiary; a serious work of natural history of its day. It is therefore an interesting combination of fact and fancy, myth and rumor about animal life. Truly life history knowledge was usually rudimentary in the twelfth century. The wolf, for example, whelps only in May and then in thundery weather. The phoenix is an Arabian bird that lives even to be five hundred years old and, "when it observes its life to be coming to an end, it makes a coffin for itself of frankincense and myrrh and other spices, into which, its life being over, it enters and dies."

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Nature in Print

By HOWARD ZAHNISER

WHEN vitality seems to ebb low and a virus or some other vexation takes one away from the routine of activity that makes up so much of human living, there can be an inspiration—a breathing in of new spirit—in thinking about the marvellous vitality that is in and through our universe, the variety of creatures in which this finds expression, the mysterious ways in which even an individual partakes of this communion of Life. In April all about us the life in lawn and garden, fields and woods, along the streams that we cross or hike along, in our city parks, in the country, and most particularly in ourselves, springs . . . . . *spring*! But in winter life ebbs, and we remind ourselves of what in spring will outreach our remembrance and astonish us. So lying abed on a winter day, for the restoration that comes with rest, I turn to books and by good fortune find a tonic, in pictures and words, in the sense of the abundance of life. Even though the volumes I chance to have at hand are not involved with the flora at all, and thus come far short of representing the whole biotic abundance of our universe, I am overwhelmed, and then elated, as I try to apprehend this pulsating creation.

Dr. Charles Tate Regan, introducing an 896-page, heavy tome on *Natural History*—so large that, in fact, it hardly would be expected to be a bedside volume—apologizes for the *omissions* of the book with the almost incomprehensible comment that "the Animal Kingdom of today may include about ten times as many species as there are words in this book." Words, *words* in a volume of 896 pages! Eight hundred and ninety-six pages of words multiplied by ten, to suggest the number of species in the "animal kingdom of today"! The species of flora yet to be added, to total only the various *forms* of life in all the biota of our world! What a marvel of life!

Is it not well once in a while thus to make general surveys? Our specialized knowledge, our *particularly* interesting literature, resulting from advancing studies and ever-new expressions, are marvels of their own, lining our shelves with many volumes. Once upon a time we lay on the floor with the huge book of all natural history. Now in the armchair we have entire volumes on particular species—on the song sparrow alone, or the robin, or the fulmar. Even our works on all birds become—and to our great advantage, of course—books on all the birds of smaller geographic areas, of America, of the New England States, of Florida, of western Pennsylvania. And as we thus peruse more and more about increasingly particular areas—areas of land and of understanding—do we not make all the more welcome an occasional return to a volume that surveys great regions of the world, or of knowledge, and even suggests the whole compass?

I think so!

Paul Barruel's *Birds of the World: Their Life and Habits*, translated from the French by Phyllis Barclay-Smith and recently published in New York by the Oxford University Press, has suggested these comments. A high, wide, and handsome volume, it attracted my attention by its photographs and color plates, and thus happened to be at hand when virus-induced leisure relieved some of the urgencies and suggested relaxation with something not timely.

(Thus timeliness is revealed!)

From all over the world come the photographs, and subjects of photographs, that seem so charming and alive, or interesting and vital, on this book's large pages. One might think such a large book as this—tall and wide—hardly a bedside volume either, no more than Dr. Regan's thick and heavy tome, but the large photographs propped up in front, or spread on the bed for turning and sprawling, prove pleasant indeed—at least for "resting" in bed. And the color plates, of course, bring brightness. The reproduction of the color photographs brings an engaging realness; Eric Hosking's photograph of the greater black-backed gull on its nest, for example, or Dr. Sapin-Jaloustre's view of the Adélie penguins in the economy of color in their snowy, icy rookery.

Paul Barruel's color-plate paintings, his illustrations of so many colorful birds of the world, are especially interesting and gay. The first of these plates, for example, shows five fruit-eating birds—blue-naped mouse bird, spot-billed toucanet, pink-necked fruit-dove, masked trogon, and lesser green leaf-bird—and the second plate is a brilliant grouping of the heads of nine birds, entitled "Types of Exotic Birds with Specialised Bills," where from our European artist's viewpoint our own ivory-billed woodpecker is as exotic as the scarlet ibis of tropical America or the great-billed parrakeet of Moluccas.

Other plates of Paul Barruel's paintings group together nectar-eating birds, birds of the temperate Eurasian forest, birds of the Mediterranean region, birds of the mountains, and ground birds of tropical forests. Another shows two cuckoos of Africa, brilliant in green, with three of their hosts. One particularly striking painting is of a pair of wrynecks displaying after inspecting a prospective nesting hole in a branch, and three other plates are displays of the birds' display—one of grouse, another of Wallace's bird of paradise, and, most brilliant of all in the book, a plate showing the display of the Himalayan monal.

The text of this book proved interesting too. Writing of birds in general and from a universal viewpoint, our author-artist-naturalist chooses his data, his illustrative particulars, from all over the world, but his readers' destiny is in an understanding of the whole class Aves, with, of course, a better appreciation of individual birds of our own acquaintance, which comes with a perception of the characteristics they have by virtue of their membership in this class. Thus the body of this book is in its first three chapters, entitled "Daily Activities," "Reproduction," and "Migration." A fourth, short chapter discusses solitary and gregarious birds, and another brief chapter, entitled "Bird Populations," discusses habitats and the fluctuations of populations. A "Conclusion" comments on bird psychology, and a "Classification of Birds" lists the various orders and the families that comprise each.

It was Barruel's *Birds of the World* that in turn called to attention Dr. Charles Tate Regan's *Natural History*, published some two years ago in this country—a British work distributed here by John de Graff, Inc., of 64 West 23d St., New York 10, N.Y. Although without the exquisite excellence of Paul Barruel's paintings as reproduced in his *Birds of the World*, this work has sixteen color plates that bring one the interest of pictures of a variety of creatures, from butterflies and bees to macaws, elephants, and primates. The black-and-white photographs comprise one of its great features, more than a thousand of them, valuable illustrations of many species not likely to be shown elsewhere in a small library. Similarly, the text is a great reference work for descriptions of birds, reptiles, mammals from all over the world; a work written from the world viewpoint of British naturalists. Dr. Regan himself writes of the fishes, G. C. Robson of invertebrates other than insects, D. Aubertin of insects, E. G. Boulenger of reptiles and amphibians, W. B. Alexander of birds, and R. I. Pocock of mammals. Thus, as in the French world viewpoint of Barruel's *Birds of the World*, we here not only see the whole world of animal life, but, also, for our view escape from the horizons within which we normally look out on the universe.

Through much of this large volume of *Natural History* one

Brief Parenthesis

By HELEN MITCHEL

Across the luminous morning drifts
The redolence of peach tree bloom.
The heart of spring, from darkness lifts
A petaled cloud of frail perfume.
Then close your eyes, and only breathe
The bitter-sweet, be more aware
Of how the shattered flower-sheathe
Cascades pink incense on the air.
And for the moment know but this
Ethereal, brief parenthesis.

must be content with browsing and recognizing the value of its descriptions for one seeking information on specific species on reference occasions, yet there are indeed here also great temptations to reading. And as from Paul Barruel's *Birds of the World*—which is good reading throughout—there comes the inspiration of the deep richness of the universe perceived in this diverse unity of life. As I write on a snowy, ice-cold Saturday in February these recollections of that January day of rest and recreation, with these books, refreshed of course with a new look at the volumes, there seems a veritable zest of winter within me, an exhilaration not alone (I surmise) from my own vitality responding to wintry challenge but also from this renewed sense of the vitality of the universe.

Birds of the World; Their Life and Habits. By Paul Barruel. Translated by Phyllis Barclay-Smith. New York: Oxford University Press. 1954. 204 pp. (8¾ by 11½ in.), with preface by Francois Bourliere, 44 text drawings, 160 photographs (6 in color), 55 paintings on 12 color plates by Paul Barruel, bibliography, classification of birds, and index. $12.50.

Natural History. Edited by Charles Tate Regan. (Invertebrates other than insects by G. C. Robson, Insects by D. Aubertin, Fishes by Charles Tate Regan, Reptiles and Amphibians by E. G. Boulenger, Birds by W. B. Alexander, Mammals by R. I. Pocock.) London and Melbourne: Ward, Lock & Co. Distributed in the United States by John de Graff, 64 West 23rd Street, New York, N.Y. No date. 896 pp. (7 by 10 in.), with 46 figures in color on 16 plates including 13 paintings by J. C. Dollman and 8 other paintings with signatures missing or illegible, 1,092 photographs, and index. $10.

Allen on Conservation

Conserving Natural Resources. By Shirley W. Allen. New York. 1955. McGraw-Hill Book Company. 347 pages. Illustrated. $5.50.

Dr. Allen, who is Professor Emeritus of the Department of Forestry, School of Natural Resources, University of Michigan, gives this important book a subtitle: "Principles and Practice in a Democracy." He says that he has for some years sought a textbook on conservation at the college level, written by one author, concerned with social and economic aspects of conservation practice, and covering both renewable and nonrenewable natural resources. So he wrote such a textbook himself, and has made a valuable contribution to the literature of conservation. Dr. Allen has done an immense amount of deep thinking on this vital subject; thinking that goes much deeper than the surface manifestations of methods. He points out in his preface that "conserving natural resources in a free country is anything but automatic. The one best hope for it in a democracy is the very fact that our sort of government is founded on the agreement of a great people to live fairly together."

While this volume is designed as a textbook, its value and usability is not by any means limited to the college classroom. Indeed, one would wish that this book might be read by all thinking people interested, in whatever degree, in conservation, even by those who regard themselves as well informed. Shirley Allen has lived through the years in which conservation has gradually come of age and has been a part of that maturity. Thus his discussion of the history of our developing opinions on all phases of conservation is especially valuable and informative.

Bee Keeping

Bees Are My Business. By Harry J. Whitcombe, with John Scott Douglas. New York. 1955. 245 pages. Illustrated. $3.75.

The author of this book started being a bee keeper at the age of seven, when he persuaded his reluctant father to let him have a hive. His bee keeping grew until, during depression years, it contributed to the family budget of his parents, and then helped pay his way through college. Today Mr. Whitcombe is one of the largest shippers of package bees in the world. This is a fascinating success story, delightfully written.

Wood Carving

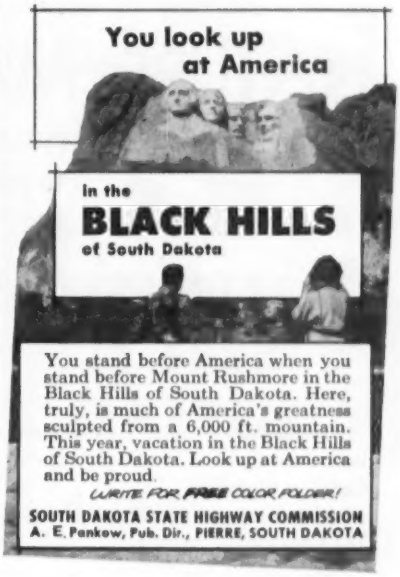
How to Do Wood Carving. By John L. Lacey. New York. 1955. Published by the author at 531 Hudson St., New York 14, N. Y. 144 pages. Illustrated. $.83.

With the use of step-by-step photographs and accompanying text the author of this practical book shows how one may learn to carve dogs, horses, elephants, tigers, fishes, deer and birds. Information on simple tools needed leads to the manner in which one may carve many things of Nature.

Backyard World

World Outside My Door. By Olive Bown Goin. New York. 1955. The Macmillan Company. 184 pages. $3.50.

Writing about the natural history to be found in a small area close to one's home is not a new approach. However, it is rare that such an area is described with the charm that is to be found in this book. The "world" outside Mrs. Goin's door is a half-acre of back yard on the edge of a southern city. It is, of course, a world of small creatures, but, to one who has the wish to know its inhabitants, they are many. The author is, to be sure, a biologist, as is her husband, but she tells her story for the layman, not the professional.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NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3, 1917, and February 28, 1925. $4 a year; foreign, $5.00. Additional entry Easton, Pa.

Publication and Editorial Office, 1214 16th Street, N. W., Washington 6, D. C. Additional office of publication, Easton, Pa.

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Briefly Noted

Poyke, The Parrakeet. By Wally Carlson. Fond du Lac, Wisconsin. 1955. All-Pets Books. Photography by Hardy Wieting. A picture story of a parrakeet.

Arthritis and Radioactivity. By Wade V. Lewis. Boston. 1955. Christopher Publishing House. 168 pages. $2.50. Report on a "uranium-radon mine" near Boulder, Montana, said to have curative importance.

Dictionary of American Proverbs. Edited by David Kin. Preface by Mark Van Doren. 290 pages. $6.00. Alphabetical listing of American proverbs about many things, from Ability to Zeal.

Africa—The Trip of a Lifetime. By Ernest H. Fletcher. New York. 1955. Comet Press Books. 86 pages. Illustrated. Besides hunting, the author concerns himself with life and economics in Africa.

The First Book of Hawaii. By Sam and Beryl Epstein. New York. 1955. Franklin Watts, Inc. 65 pages. $1.75. An introduction to Hawaii for the younger reader.

First Camping Trip. By C. B. Colby. New York. 1955. Coward-McCann. 48 pages. $2.00. Sketches, diagrams and brief text instruct the neophyte camper on living outdoors.

Anthropolgy. By J. Manchip White. New York. 1955. Philosophical Library. 190 pages. $2.75. A concise introduction to physical, cultural, social and applied anthropology.

The Swans of Willow Pond. By Olive L. Earle. New York. 1955. William Morrow and Company. 64 pages. Illustrated by the author. $2.00. The story of a swan family for the younger reader.

Chickens and How to Raise Them. By Louis Darling. New York. 1955. William Morrow and Company. 63 pages. Illustrated by the author. $2.00. A simple little description of the pleasure and profit in chicken raising.

Rambling Rhymes and Whimsical Jingles. By D. H. Wenrich. Ridley Park, Pa. 1954. 21 Hinckley Ave. 126 pages. $1.60. The author enjoys writing verse, and here collects his rhymes and jingles dealing with a wide variety of subjects.

The Evolution of an Insect Society. By Derek Wragge Morley. New York. 1955. Charles Scribner's Sons. 215 pages. Illustrated. $3.95. A British entomologist writes interestingly of a community of British wood ants, typical of similar ant associations in other parts of the world.

Attracting Birds

Attracting Birds to Your Backyard. By William J. Beecher. Fond du Lac, Wisconsin. 1955. All-Pets Books, Inc. 63 pages. Illustrated. $1.00.

This little paper-bound book is a simple and concise guide to ways in which one may make one's home grounds attractive to bird visitors. Advice is given on making the yard more alluring to avian visitors, and how to provide feeding areas and shelter.

Bulletins

"Canton Island" by Robert Cushman Murphy, Robert J. Niedrach and Alfred M. Bailey is a 78-page booklet of the Denver Museum of Natural History, published as No. 10 in the Museum's series called Museum Pictorial. It is a fully illustrated discussion of this one of the Phoenix Islands, an important stepping stone in airplane flying from the United States to Fiji and Australia. The bird life is varied and interesting. The price is $1.00.

"Aransas: A National Wildlife Refuge" by Julian A. Howard is No. 11 in the "Conservation in Action" series of the U. S. Fish and Wildlife Service. This Refuge is particularly noted as it is the wintering ground of the whooping crane, among other forms of resident wild life. Fifteen cents from the Superintendent of Documents, Washington 25, D. C.

Other recent bulletins of the Fish and Wildlife Service are available from the Superintendent of Documents, Washington 25, D. C. These are "Noxious Marine Animals of the Central and Western Pacific Ocean" by Charles J. Fish and Mary Curtis Cobb, 45 pages, 35 cents; "Method of Estimating Fish Populations with Application to Pacific Sardine" by T. M. Widrig, 28 pages, 30 cents; "Feeding Mechanism of the Sea Lamprey and Its Effect on Host Fishes" by Robert E. Lennon, 48 pages, 40 cents; "Whitings on the Coasts of the American Continents" by Isaac Ginsburg. 24 pages, 20 cents; "Intertidal Spawning of Pink Salmon" by Mitchell G. Hanavan and Bernard Einar Skud, 20 pages, 15 cents; "Description of Eggs and Larvae of Jack Mackerel" by Elbert H. Ahlstrom and Orville P. Ball, 40 pages, 30 cents.

"Penngift Crown Vetch" by H. B. Musser, W. L. Hottenstein and J. P. Stanford is a discussion of the value of this plant in holding soil. Published by the College of Agriculture, Pennsylvania State University, State College, Pa.

"Terrariums: Indoor Gardens in Glass" by Mabel H. James is available for five cents from the Buffalo Museum of Science, Buffalo, New York.

Recent publications of the U. S. Forest Service available from the Superintendent of Documents, Washington 25, D. C. include "Forest Service Films," a list of films available for loan and where to get them, 10 cents; "Bark Structure of North American Conifers" by Ying-Pe Chang, 86 pages, 35 cents; "Seeding Rangelands in Utah, Nevada, Southern Idaho and Western Montana" by A. Perry Plummer, A. C. Hull, Jr., George Stewart and Joseph H. Robertson, 73 pages. 30 cents; "Protecting the Forests from Fire", 32 pages, 15 cents.

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WHY MANABOZHO PUNISHED THE BIRCH TREE

A Chippewa legend retold

By LOUISE J. WALKER

MANABOZHO was a queer fellow. He could make himself as tall as a tree or as small as a turtle or snake. He could change himself into any animal he pleased. He often talked with animals, birds and fishes. Nothing could kill him. He could not be drowned even though he dropped hundreds of feet into the lake. In fact, when he tumbled into a fire, he could not be burned to death. He often met with accidents, but he was never hurt. Manabozho often left his mark on rocks, trees, leaves and flowers. He had a bad temper. Sometimes he caused trouble and spoiled the looks of many beautiful things. Yet he was a friend of the Indians and helped them in many ways.

One day in autumn as Manabozho walked along the lake, he felt hungry. As he walked, he saw an object coming toward him. He didn't have to wait long before he saw it was a great black bear. Quickly Manabozho pulled up a young tree by the roots. He then hid and waited to kill the bear when it should come near. When the bear was close to him, Manabozho jumped from his hiding place. He killed the bear with one blow. Then he built a fire. Next he held the bear over the fire to burn off all its fur. A few minutes later, he cut up the bear into pieces and set them roasting. When the meat was cooked, Manabozho planned to have a fine dinner.

While Manabozho was busy getting dinner, he heard a strange noise. Two tree tops rubbed together in the wind. The noise made Manabozho very nervous. He decided to stop the noise. So he left his dinner on the ground and climbed one of the trees. He reached the spot where one tree rubbed against the other one. While he was trying to pull the two big trees apart, his hand got caught between them. He pulled and pulled but he could not get his hand free. Just at that moment, he heard a pack of wolves running toward his bear meat. The fierce wolves were hungry. They smelled the roasting meat. Soon they were eating it in spite of Manabozho's shouts.

At last when Manabozho got his hand free and climbed down, all his dinner had been eaten except the bear's skull. Manabozho was very hungry. He was very angry too. He was angry with the wolves that had eaten his dinner. He wanted to punish them, but they had run away. He decided to punish the great birch trees at once so they would never squeeze his hand again. He got a big strong whip. Then he whipped the trees very hard. Until this time, the birch tree had been the most beautiful of all the trees. Its trunk had been snow white. It had not had any scratches or marks upon it. But ever since Manabozho whipped it, the birch has had the marks of that terrible beating. Of course, this is why the birch tree seems to have many scars today.

THOMAS THE TURTLE

By RALPH E. WILL

IT WAS a special summer that the young turtle decided to live in the brook that runs along the edge of the lawn at our place in the country. He was deliberate, unimpressive, as all turtles are, but he had come to the little dug pool that breaks the current of the brook, and he had stayed, and that made him ours. Unimaginatively, we had named him Thomas, and I set about training him. He was as wild and shy as any of Nature's children, but within three week-ends he was eating meat scraps from my hand, coming when called and propping himself clumsily on the rocky bank to be fed. I felt a great sense of achievement when I was permitted to scratch the hard, smooth top of his arrow-shaped head, although I doubt that he felt it much, if at all.

Then one dreadful morning I went down to the bank with food to find Thomas in a state of severe shock. During the night an animal with incredibly strong jaws had bitten off Thomas' left hind leg. Shreds of flesh and skin showed from under his shell, but nothing more. He stayed still under the clearing water, did not respond to our pleading calls, ignored food, and for all we knew, he was dying. Thomas never surfaced again, he never fed, and one morning when we walked sadly down to check his condition, he had disappeared. His fate was unknown to us, but we were almost certain that the night marauder had returned to claim his crippled prey. That was eight years ago. Many times since we have come across turtles around the place, and always the same first question, "Has he four legs?" "Pick him up or make him walk!"

This summer the brook below the pool dried up and I walked down its center, cutting back overgrowth along the bank until I almost stepped on a still turtle. As usual, legs and head were withdrawn. He was quite large, not much like our Thomas of eight years back, but within a minute I was rushing to the house shouting the incredible news. I had found Thomas! There it was, a short, blunt stump for a left hind leg! As I carried him up to the pool, my wife Cathy came out with meat scraps. Could he possibly remember his friends of so long ago? The old routine? It took perhaps ten eager, agonizing minutes, but I was sure it would happen, and it did. Thomas had not forgotten, and we hand-fed him again and again all afternoon, feeling, perhaps, that we were insuring his permanent return to the pool where his meals had been so regular. In the morning Thomas was nowhere about. I walked the dry brook bed in both directions as far as I thought a three-legged turtle could possibly have traveled overnight. No Thomas. But we are happy about him now. He survived his shocking injury. He "works" our brook, so we may see him again. And he remembered. He remembered for eight years. And who is to say that, even for a turtle, eight years is not a long, long time for one of Nature's creatures to remember kindness at the hands of a human being he chanced to meet?

REFLECTIONS ON THE KILLING OF A GOOSE

By DAVID FAVILLE TILLOTSON

GUNS loaded, we waited breathlessly in the tall prairie grass. On they came, a wavering, silent line of seventeen honkers; wings set; caution abandoned; desperately in need of rest after a long, opening day's shotgun bombardment. We waited, and waited,—forever it seemed—and then they were right on us, settling down.

Thoughts about which barrel first were forgotten. We stood up together, a pair of greenhorn hunters if there ever were any. I had a double-barreled, 12-gauge Ithaca, my friend had a repeating Winchester 12.

The geese saw and began to climb, wings frantically straining the heavenly blue for more traction. Our guns spoke five times. One goose faltered, and began to arc off to the right in a long glide for freedom; the rest wheeled north and left. We ran to where we thought the goose had dropped; a bittern, which by an unkind quirk of fate happened to be in the vicinity of the downed goose, rose, to be torn to bits by lead destined for the well-hidden goose.

The dog soon stood quizzically near the goose and waited for action. It was an awful moment. The bird stood there, erect and alive in a dried-up opening in the rushes near a muskrat house. Its only injury was a damaged wing. It seemed disdainful as it waited, and I felt somehow that it was not a triumph for us but a victory for the bird.

It was not like killing a gopher or a rat. It was not fun at all. The blood stain in my hunting coat will remain until the coat is discarded, but the stain on my heart will remain as long as I have a heart. I would like a chance to relive that moment. I believe that many a hunter of wild things would, if he could, do things quite differently a second time.

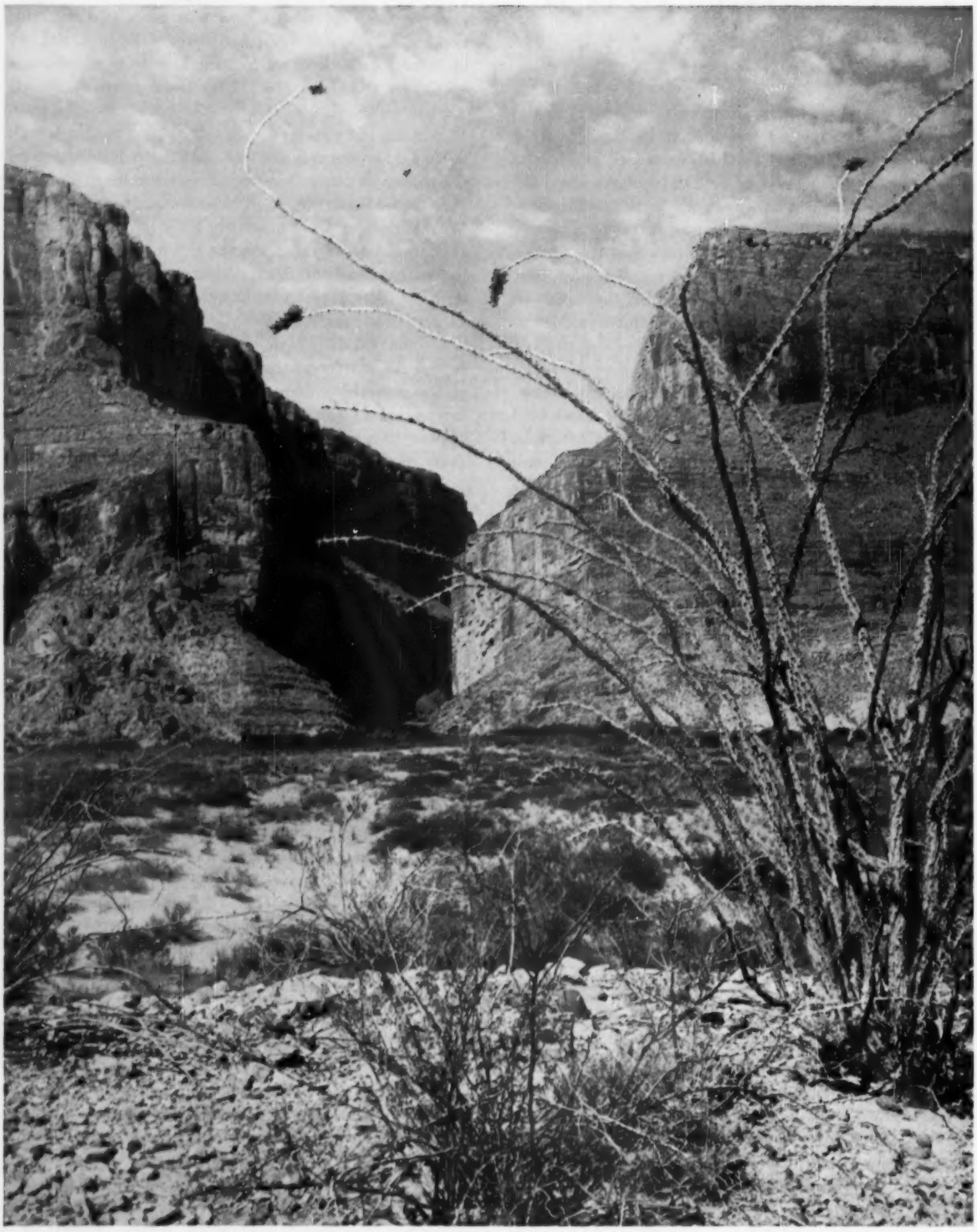
Five years have since passed, and I have observed many a proud Canadian goose. This noble bird, ornithologists say, often mates for life and stays with its family until death ends it all. Last spring I saw a singelton wheeling about over the spot of the kill. It was uttering an almost human kind of cry as it passed back and forth over the spot. Would you not wonder, as I did?

Contents Noted

STEADILY rising are the figures showing travel to the areas under the administration of the National Park Service. The 1954 total is announced as 47,833,913, which is an increase of 1,609,119 above the 1953 total. Out of curiosity we resorted to the adding machine to determine the proportion of travel to National Parks and National Monuments, areas that the Service was originally set up to administer. We find that 17,968,596 visitations are recorded for the areas in Park classification, and 7,853,271 for those in Monument status. This totals 25,821,867, or 53.2 percent of the visits. The balance were visitors to National Historical Parks, National Military Parks and Cemeteries, National Battlefield Parks, National Battlefield Sites, National Historical Sites, National Memorials, National Parkways, National Recreation Areas, and one National Memorial Park. All these latter areas have gradually been added to the responsibility of the National Park Service. They have been added without increase in appropriation in proportion to the responsibilities that the Service has been asked to shoulder. And, in our opinion, this development has been at the expense of adequate funds properly to administer and maintain those basic areas for the care of which the Service was created. Many of the reservations have been added at the instance of the Congress, or by local pressures through the Congress. If all of these areas are worthy of preservation—and most of them are—then they must be properly staffed and maintained. It is time for the Bureau of the Budget and the Congress to face facts and provide funds accordingly.

DESIGNATION of the rose as the national flower of the United States is provided for in Joint Resolution 11, introduced in the Senate by Senator Margaret Chase Smith of Maine, and in the House by Congresswoman Frances P. Bolton of Ohio. The resolution points out that the United States is the only major country without a national flower; that the rose "has for many years been the favorite flower of the American people who prefer it by a margin of eighteen to one over any other"; that the rose "has long represented love, courage, loyalty, and devotion and has become an international symbol of peace"; that several States already honor the rose as their official flower. Georgia's flower is the Cherokee Rose; Iowa's the Iowa Rose; North Dakota's the Prairie Rose and New York's State Flower is just plain rose. The cultivated varieties and wild species of the rose are legion, and no one rose is specified in the Resolution. We are, of course, much interested in this proposal. In 1929 and 1930 the American Nature Association conducted a nation-wide poll to determine public sentiment for a national flower. Prior to that there had been resolutions in Congress favoring the columbine and the goldenrod for this honor. In our poll 1,067,676 votes were cast, 492,811 of these for the *wild* rose; 261,451 for the columbine; 96,403 for the violet; 84,112 for the goldenrod; 30,492 for the phlox; 30,482 for the American Beauty rose; 16,860 for the daisy; 13,082 for the mountain laurel; 9,024 for the dogwood, with 32,509 votes divided among a number of other flowers. The columbine "carried" Florida, Massachusetts, Minnesota, Colorado and Washington, and was nosed out by seven votes in South Dakota. The wild rose was the victor elsewhere, amassing a big lead in floral "electoral" votes. In the depths of the depression, Congress was concerned with greater problems than a National Flower, so no action was then taken. Now the Smith-Bolton Resolution brings the matter to the fore again, and we would like to see something done about it. Indeed, it would be interesting if the supporters of the columbine, who appear to be many, would introduce a resolution in favor of their candidate, which has certain appropriate symbolism. Perhaps supporters of the goldenrod, which is the State Flower of Alabama, Kentucky, Nebraska and North Carolina, would like to promote their candidate. Congressional debate on the relative merits of several proposed national flowers might be stimulating, and a welcome relief from some of the more important but less esthetic issues that confront our legislators.

THIS year we salute the United States Forest Service on the Golden Anniversary of its creation as a Federal agency in the Department of Agriculture. More than five-hundred friends and co-workers of the Service from many parts of the country gathered in Washington in early February for a dinner in tribute to this agency. This event was sponsored jointly by the Society of American Foresters and the American Forestry Association. The U. S. Forest Service came into being in 1905 through the merger of the then existing Bureau of Forestry and the forestry division of the General Land Office. Gifford Pinchot was the first Chief of the Service, and Mrs. Pinchot was an honored guest at the dinner. The record of the Service is a distinguished one, and the place in our economy of the great National Forests that it administers is an important one. It is well, today, to direct attention to this half-century of forestry accomplishment, since we are too often faced with attempts of private interests to appropriate to their own purposes certain of the assets of the nation's public forests. Recent years, also, have seen a tremendous increase in the use of the National Forests for recreation, a development that brings them closer to millions of citizens. We may all join in 1955 in saluting the United States Forest Service, and the men and women who labor for it in behalf of all of us. R.W.W.



The desert valley that surrounds the Chisos once was level with the top of this parapet, through which the Rio Grande cuts its way into Big Bend National Park.

PHOTOGRAPH BY NATT M. DODGE, COURTESY NATIONAL PARK SERVICE

The Chisos Mountains rise dramatically from the desert floor in Big Bend National Park in west Texas.

Hidden Giants of the Chisos

By GEORGE S. WELLS

In west Texas there is a place where Douglas firs grow next to prickly pears, and where a strange, unseen forest of ponderosa pine blankets the slopes of an upended desert. There is no timber line in this incredible country; only a dust line marks the point at which the sighing winds and the summer cloudbursts carry on their work of knocking the underpinnings from under America's strangest mountain range.

The forest and the slopes, which ripple in the winds like the surface of the sea, are only two phenomena among many in our newest national park, nestled in that great elbow of the Rio Grande called The Big Bend. And the mountain range itself is a lost detail called the Chisos, owing allegiance neither to the Rockies nor the Appalachians.

Big Bend starts abruptly being different. Unlike many other mountain parks, it is not draped across a scenic portion of some range. Rather, its boundaries encircle a great fallen desert, squarely in the center of which is the forbidding rocky eminence of the Chisos range. Thus, in Big Bend, we have a kind of botanical and biological "island," so completely separated from any other mountain chain that its wildlife is actually able to migrate within its boundaries as the seasons change.

Even former superintendent Lon Garrison, long used to superlatives from the years he served at the Grand Canyon, was inclined to raise his hands expressively, lacking words to describe the area that was his charge before he left for Washington. He would point out to a visitor the mule deer that haunt the cactus-studded slope below Panther Junction headquarters.

"There," he would say, "is just a sample. The mule deer come down here into the desert, and the white-tails stay up in the mountains, just the opposite from any normal, sensible deer anywhere else."

The mention of white-tails, of course, will lead to the subject of their habitat, and then one learns of the cool green forest that is their haunt. However, one finds it difficult to believe that there is such a place in the wilderness of painted rocks and jagged fissures that loom high in nightmarish fantasy.

In fact, it takes a dogged, persistent search to find this area. Even when seen, it is difficult to believe that such an improbable forest exists, for the taste of dust is still in the searcher's mouth, and the sweat of desert heat is on his brow.

It is understandable that few visitors to Big Bend ever thrill to the soft touch of pine needles beneath their feet, or even to the distant sight of tall trees. It is a gruelling ten-mile drive up the mountainside and into The Basin. Then it is a long, eight miles farther up, by way of a rock-strewn path that crosses the shoulder of 7835-foot Emory Peak, highest point in the park. Only after crossing this soaring barrier is the cactus left behind, and your footsteps pad on soft

PHOTOGRAPH BY GLENN BURGESS

One of the "giants" of the Chisos is this Arizona cypress, hidden in a high fold of the mountains called Boot Canyon.

loam instead of rocks. Then a look upward toward the heavens reveals the Douglas fir trees gathering here to form a forest in the midst of desert.

Later, a still higher climb leads to another kind of thrill up on the very "Roof of Texas." Known formally as the South Rim, this knife-edge escarpment falls away below for a distance of 1500 feet. Spread out below, a mile straight down, is the tag end of the Chisos, dropping in terraces to the silver hairpin that is the great bend of the Rio Grande.

But, strangely, the forest has disappeared behind. Here, on The Roof, nothing grows but a few stunted junipers and an endless hedgerow of armored plants such as the lechuguilla and the fishhook cactus. Where has the forest gone?

The eyes of W. Leon Evans, assistant superintendent, lit up at the very mention of this special province of the 708,221-acre Big Bend park. "The big trees grow only above seven thousand feet," he explained, "and they are confined to the north slopes. How they got there is lost in time, but we know how they survive. It is because they are protected in the heads of deep canyons from the burning rays of the sun and from the dry south winds, which would sap their strength and their carefully hoarded moisture."

Rains are scarce at any time, and especially so in recent years, but the timber trees of the lost forest soak up moisture from the very clouds. They store the precious droplets among their roots in the only sizable bit of topsoil to be found anywhere in the Chisos.

Before returning for a closer look at the forest, let us consider how it came to be there next to Mexico, and—much more amazing—how it happened to escape for so many centuries from the hazards of fire and the axe.

The whole great desert floor that comprises the Big Bend is a curious freak of Nature, for once it reared two thousand feet above its present level. Then the earth shifted and parted and a giant wedge, 35 miles wide and 100 miles long, slapped down as if on hinges, leaving the broken face of Mexico's Carmen mountains looming straight up from the southern bank of the river. A series of tremendous canyons was formed along the 120-mile river border of the park, as the Rio Grande cut its way through one mountain range, across the broken valley floor and out through the Dead Horse range of the east.

Only half a century ago, the Rio Grande ran swift and deep through its precipitous gorges. When the spring rains came to the Big Bend, the river's crest changed but little, for the floor of the valley was hip high in rich grasses, which soaked up and held the moisture along their roots.

Now the grass has disappeared, and with it the soil, so that the rains beat futilely against the impervious clay. Like droplets on a greased surface, water gathers and runs off into gullies, and then into great gashes in the earth that lead down to the wall of the Carmens. There they join forces with other run-off rivers, sometimes raising a great battering ram of water forty feet high to plunge its destructive way down the canyons.

The Chisos Mountains were green clad in former times, with the grass-lands climbing the talus slopes, and giving way to scrub oak and the needle-bearing trees. Even then they included pinyon pine, and finally culminated in the glory of the great trees in the shadowed depths of the highest canyons.

Then came the miner's wagons, freighting ore out of Boquillas and Terlingua, up across the lush grass of Tornillo Flat. The wagons made ruts, which the spring rains deepened. The burros and other stock, taken along for the gruelling 100-mile haul, ate the grass in an ever-widening swath. The wind followed the wagons, riffled the soil and smothered the gnawed-down stalks.

Douglas firs offer startling contrast to the strange, arid country that maroons them to a few high canyons.

PHOTOGRAPH BY GLENN BURGESS

The land might have survived the onslaught, had it not been for the advent of the rancher, who suddenly became aware of rich grazing lands west of the Pecos. The herds were small at first, in proportion to the current niggardly value of beef. Then came World War II, when 20,000 head of stock were moved into the Terlingua Creek bottom alone. Overgrazing finished the job that the ore trains had started, and the land began its transition into desert.

Next came gangs of men, climbing the slopes of the Chisos with axes on their shoulders. They needed timber for mine joists, and they took the nearest at hand, the pinyon pine, the juniper and the oaks, which had grown for centuries on this mountain "island."

Deeper went the cinnibar pits, and higher went the axemen for their timber. The now growing desert climbed out of the bottoms and crept slowly into the very heart of the mountains. Without the trees to hold it, the water from the rains went sluicing down with express-train speed, carrying off the thin soil, and leaving only water-worn gullies in the rocky skeleton of the Chisos. The winds followed the rains, turning the remaining fragments of soil into shifting sheets of dust, beginning the first faint trace of wind erosion among rock faces now unprotected by any screen of forest cover.

Only in the highest, most inaccessible reaches of the mountain did the forest escape the onslaught. But because the arid climate and pitiless sun had preceded the axemen, the forest of Douglas fir and ponderosa pine and Arizona cypress had hidden itself well among the crevices. Even if they toiled high enough to glimpse this tempting stand of timber, the miners could not profitably haul it down from its high sanctuary.

And so the big timber of the Chisos escaped, clinging precariously to its life-giving topsoil, serenely aloof from the dust line that crept toward it up the slopes.

At Boot Springs, where the trail touches the fringe of the forest, and where the park's only forest fire lookout is stationed, there are clustered perhaps a hundred Douglas fir trees. One of these is a giant that brings gasps of delight from tourists riding up the trail. Most, however, are somewhat stunted in this high, dry soil. But, mixed with the firs, there are hundreds of Arizona cypresses, which soar seventy feet or more. Down the mountainside, in the direction of The Basin, the forest thins before the reaching tentacles of the desert, and one sees the strange sight of prickly pear cactus and century plants sprouting from among clusters of fallen cones.

As yet there is no trail into the strongest, thickest forest. But one can see the forest from a distance from the easy grade of the Lost Mine trail. Looking across the intervening miles, into Juniper Canyon, one sees a dark line stretching across the shoulder of Flat Top Peak, a lush stand of ponderosa pine. These trees are not measured in mere hundreds, for they form a veritable carpet, winding in and out of the great northern folds of the Chisos.

Although the pine forest is the most dramatic sight, there are other oddities for the persistent explorer of the upper slopes. For instance, quaking aspens grow

The floor of Santa Elena Canyon is nearly a mile below the hidden forest of the Chisos. At this point in the canyon, walls rise nearly 1700 feet straight up from water's edge. Little known to the public, these canyons of the Big Bend form one of the nation's scenic wonders.

in lone clusters on the northeast and south slopes of Emory Peak. And one can find scattered representatives of maples, ashes and other hardwoods native to more northern climes.

In the Chisos Mountains plants from the North and the South meet, for the dominant vegetative forms come from the Canadian and the Lower Sonoran life zones. One may note this as he descends the slopes, or up on the flat-tops of the peaks. Mixed in with lechuguillas, candelillas, and other tough plants of the desert are occasional Mexican pinyon pines, scrub oaks and one variety of juniper found nowhere else in the United States—the weeping juniper, *Juniperus flaccida*, which is at the northernmost point in its range here.

Most of the "middle slope" flora can be found for leisurely inspection within the confines of The Basin, or down on the north exposure dip of Green Gulch. There, for instance, are Emory oak, *Quercus emoryi;* Texas madrone, *Arbutus texana;* gray oak, *Quercus grisea;* mountain mahogany, *Cercocarpus*, and oneseed juniper, *Juniperus monosperma.*

The Rio Grande, which is the only full-flowing stream left in the Big Bend, has its own peculiar plant life. Ranged along its banks are willows, cottonwoods, clumps of mesquite, bulrushes and the bright green stalks of bamboo cane.

Among Big Bend plants not found elsewhere in the United States are the wild pineapple, *Hechtia scariosa*, which has been found near the Dead Horse Mountains and in the dusty lowlands, and a variety of century plant, *Agave chisosensis*, found infrequently on the slopes.

Like the plant life, the fauna is mixed, with much of it derived from Mexico, across the Rio Grande. There are more than sixty species of mammals, including the Mexican black bear, javelina, and even beavers along the river's edge. Once there were desert bighorn sheep, and these may be renewed in the Big Bend within the next few years. The Big Bend variety was a brown phase, quite unlike the glossy white Rocky Mountain bighorn in appearance.

There was a recent report of a Mexican jaguar within the park, and down on the flats a common sight is the kit fox, called the desert swift, and the collared peccary.

Fortunately, the slow washing away of a mountain range into the Rio Grande and to the Gulf of Mexico has been arrested. The National Park Service, at the instigation of and with full cooperation from the people of Texas, has placed this unique scenic treasure in perpetual care. Not only is the grazing and mining at an end, but park personnel is carrying out a program of land conservation that is slowly but surely starting the Big Bend on the road back toward the green land it used to be.

With the land literally disintegrating under their feet, the park authorities invented machines and methods to meet the challenge of a situation never before experienced. They employed a variation of the discer, which scoops out shallow depressions across the face of the valley. They used a road ripper to break up soils impervious to water. They employed bulldozers to scoop thousands of "retentions" along the water courses.

The result was that, after a single heavy rain last year, park officials estimated more than three million gallons of water had been caught and held in the soil that otherwise would have sluiced down into the already swollen Rio Grande.

Already, in the three years that have been hampered by the worst drought period in Big Bend history, the park has brought back seed grass to the desert waste and saved the land from further serious deterioration from runaway waters, damaging cloudbursts and wind action.

Local ranchers have been so impressed that they are using the park unofficially as a sort of laboratory to help them plan their own programs of conservation in an overgrazed and drought-ridden cattle country.

It will take a long time (Continued on page 218)

A skein of Canada geese over the border country of Chesapeake Bay. Winter or summer, the marshes are a favorite habitat of many forms of water-loving wildlife.

The Chesapeake Marshes

By J. J. SHOMON

Photographs by the Author

SEVERAL times each spring, and once or twice each summer, I yield to the bids of my fishing companion to go with him to the tidal marshes of eastern Virginia. We travel into this reed country presumably to catch the elusive striped bass, but the real reason for our going is much more than this. Of the dozen or so times that I have journeyed to the Chesapeake Bay marshes, east of Mathews, my total catch has been three rock bass. Gilbert, my partner, who I admit is a better fisherman, has not scored much more. Yet we go. We go because the marshland has an attraction all its own. It is new, ever-changing, a land of water and reeds, of wind and sky; a wet land seemingly devoid of life yet so amazingly full of it that we feel ourselves in a dynamic world.

For those unfamiliar with marshes, there appears little of the exciting to attract the visitor. They seem just a lot of open wet land, unfit for anything but snakes and frogs, or perhaps a boot-clad muskrat trapper or a visiting ornithologist. Throw in a bundled-up waterfowler or two in the winter, when the ducks are in, and you have about the size of the human element that ever enters the marshes. What a pity! If more folks would venture into the marshes to bathe in the warming sunshine, or to observe the wild things around, we might be a happier and a more understanding people. If there is ever a place for solitude, for the clearing out of mental cobwebs, it certainly must be the marsh country. In such a place a man can think straight.

The Chesapeake marshes are big marshes. In most places they stretch for miles northward and southward. At your back is a pine-fringed tree line; facing you a sparkling blue bay area. In between there is only marsh grass, and the ever-running, falling water—salt water—and the big arc of blue or murky sky above.

When the sky is intensely blue, the sun is so brilliant that sunglasses are needed. The sun can be hot, too, for the reflection from tidal waters bakes like an oven. Wise is the visitor who comes prepared and dressed for the occasion.

But what is the real attraction in the marsh? Is it solitude? Is it the smoke-free air? Is it the strange quietness of the wet lands when the wind is stilled? Is it the sounds, noises, the sudden tranquillity of marsh wild folk? Is it the spirit of Nature itself?

To me, it was a little of all these things. A marsh

The salt water marsh at high tide on the Chesapeake. The bordering tree country is mostly sweet gum and bald cypress.

is a biotic niche, complete in itself with a little of everything thrown in. It is a perfect place for a naturalist. It is so full of animal and plant life that one square rod of a marsh's flourishing space yields natural history enough to fill an encyclopedia.

The prominent things we see first. Where Gilbert and I visit, in the deep channels surrounded by wire grass, we see first the laughing gulls on the sandbars, lifting their mouths and black heads skyward in protest as their favorite mud banks are covered by tidal water. Or we hear their peculiar noisy rejoicing on channel poles and buoys when the tide ebbs around them, exposing their sandbar preening grounds.

Or it may be, as often is the case, the shrieking cries of big, white-headed ospreys, two, three, sometimes six at a time, fluttering over the marsh greenery as they seek some floating fish in the moving tide. The marsh is osprey land, and these interesting fish hawks can always be seen doing a multitude of things, from snatching fish to building a nest of sticks on a mud shack.

There is a special interest, too, in seeing the big brother of the osprey, the bald eagle, as he puts on a spectacular aerial performance, robbing the fish hawk of its prey. Although not as common a resident of the marsh as the osprey, the lumbering eagle—most regal in America—adds something majestic to the scene, and must be forgiven his occasional tiffs with his fisherman brother. Bald eagles are getting so scarce in the United States—perhaps less than 1500 nesting pairs remaining—that the mere sight of one today is ample reward for a trip to the marshes.

On our late spring trips among the marsh channels, Gilbert and I particularly enjoy the mixed cacophony of the clapper rails. These odd-looking, chicken-like marsh birds, although seldom seen in the thick grass, put on a clattering that outdoes the noisiest hen yard. Usually one bird starts his *ket-ket-ket-cac-cac*, in the distance, then is soon followed by another and another, until the whole marsh country is nothing but a cackling bedlam. Then, just as with crickets and spring peepers, the rails sense a warning, or a secret command, and stop. A strange quiet returns to the marsh, broken only again by the distant wails of ospreys, or the louder, sharper squawks of laughing gulls. Gradually the sounds start over again.

Occasionally, when Gilbert and I are taking time out from our rockfishing to eat lunch, we catch sight of several interesting species of shorebirds. Solitary sandpipers, delicate tiny waders on stilts, drop to a sandbar, trot a few steps, pick up a morsel or two and vanish into the wind. Interesting to watch, too, are flights of spotted sandpipers as they cruise together in a sheet, or land on a mud flat, prance and peck and chirp, only to make off like a flying carpet. Whether the fish are biting or not seems not to trouble us. There is always something to see, to hear.

For those who cannot visit the salt marshes, there is the tidal fresh-water marsh. Here the vegetation is different. Marsh grasses and rushes change, and, along with them, the animal life. Muskrats are at home, their small, dome-like houses protrude here and there over the bulrushes. Raccoons are at home. There are a few stealthy mink, and, once in a while, an inquisitive otter puts in a hurried appearance.

Late in the summer and well into September, and

The clapper rail is a noisy but elusive marsh bird and cannot often be spotted as here on the edge of a mud flat. This photograph was taken on the west side of the Chesapeake near Winter Harbor in Virginia.

even early into October, when the wild rice shows its seedy tassel among the cattails, flights of sora rails descend upon the marsh during the night, soon fatten up, stay a while, then leave again for parts farther south. The sora is a small rail, about the size of a killdeer. To determine whether sora are present in the marsh all you need to do is throw a rock into the reeds, or slap the water with the flat side of a paddle. If the birds are in, a quick *kee, kee, kee* will reveal their whereabouts.

Seldom do I enter the marshes in the summer and not hear one of the oddest and strangest booming sounds in the animal kingdom. It is the broken, base-violin string *oonq-la-oonq* of the American bittern. Hard to see in the deep grass country except as a stationary stick-like object in feathers, beak pointing motionless toward the sky, it is one of America's most interesting waterbirds.

The parade of animal life of the marsh does not stop with animals mentioned but includes the songbirds, amphibians, shellfish and insects. The procession is endless, ever new, always exciting for those willing to explore. Here is refuge—still wild, untamed, much unimpaired—for man and creature alike. The marsh is a half-world between green water and brown land, where fish and birds and mammals live in peace, and where anyone may see them as God intended them to be seen. Here, in the seemingly silent and lifeless outdoors, is life so richly rewarding that it overshadows most other familiar land areas of the earth.

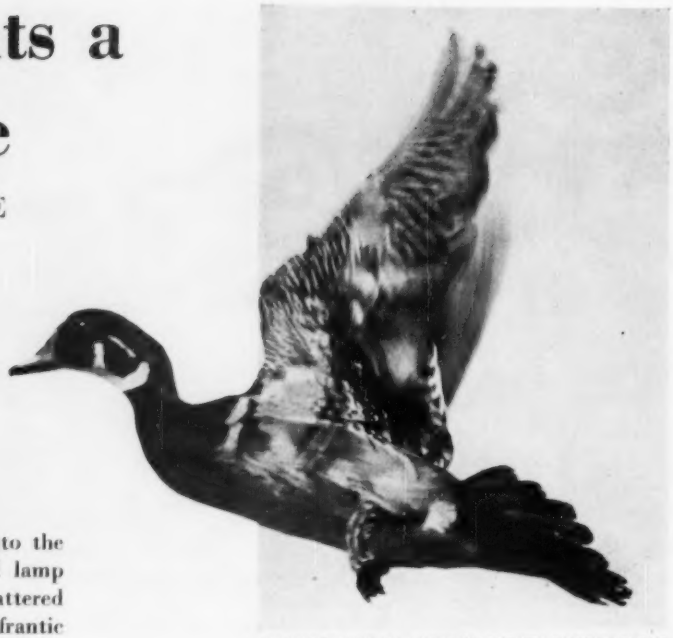
A Case for the Fox

By ELMA DEAN

Back in the dark beginnings of the world,
Perhaps Lank Wolf caught the bone that Two Foot hurled
From the family feast. Perhaps he saw that Man
Liked to be god, so the worshipping began.
Lank Wolf won his place, even a skin
For bed. Lank Wolf was what is known as 'in'.
Now, as then, on the outer edge of things,
A sharp face watches. No one ever brings
His dinner. Sleek Wolf, once a kind of brother,
Howls on his trail; and that two-footed other
Wants only his brush. His life is full of running. . .
And he has earned the grudging tribute, "cunning,"
By slyly doubling back to follow him
Who does not even guess, that, in the dim
First days, small Sharp Face might have liked to heel
And eat man food—to wag himself and feel
Hands on his scruff. Who knows but that he still
Waits for a whistle on his lonely hill.

Woody Wants a Homesite

By DANIEL A. POOLE



ILLINOIS NATURAL HISTORY SURVEY PHOTOGRAPHS

The male wood duck is the most beautiful of all our North American species of waterfowl and in need of help in finding proper homesites for its increase.

She had not meant to be an intruder, but it worked out that way. She sat quietly in the far, dim corner of the room, a thoroughly baffled female wood duck. The staring hole of the chimney stack had held great promise. In it, she hoped to find a snug recess where she might build a nest and bring forth a brood of young. Instead, it led to the fireplace and into the room in which she was captive. A lop-sided lamp shade, torn curtains at the windows, and scattered knickknacks before the wall mirror indicated her frantic attempts to escape.

Pinched by a housing shortage, wood ducks nest, or try to nest, in many odd places. Some hatch broods successfully under the eaves of boathouses and behind the cracked siding of summer cottages. Others take advantage of stovepipes that project invitingly from rural dwellings. One adventuresome bird was found in a spot where no duck would care to be—it had wandered down into a kitchen cookstove during its search. In fact, so few natural nesting places exist that these most beautiful of all North American waterfowl are forced to investigate every promising opening.

The female wood duck in a nesting box emerges just before taking off in flight.

Woodie is a victim of his own ways; he prefers to set up housekeeping in cavities in trees. Attempts of the birds to settle in barns, chimneys, and other unusual places mean that there are insufficient natural sites, a situation which, in turn, is limiting the number that do nest. Logging, swamp drainage, and other phases of the march of civilization, have taken toll of some of the choicest trees.

Plagued, rather than blessed, by their rainbow-hued splendor and by the tastiness of their flesh, wood ducks were nearly annihilated in the 1900's. Spring market hunting and the continuing loss of nesting places were more than the little ducks could withstand.

Shooting in spring is now banned, and only limited gunning is permitted in the autumn. Under this protection the birds are rallying, and interested people are pitching in to help by placing nesting boxes where they can be used.

Conservation authorities and other outdoor enthusiasts in several States—Massachusetts, Michigan, New Hampshire, Maryland, and Illinois, to name a few—are erecting thousands of nesting boxes along wooded waterways and in swamps and ponds. In the Bay State alone, 7800 boxes have been provided for wood ducks in the past few years.

Woodies are attracted easily, and they do not mind the hustle of nearby human activity as long as their

A wood duck duckling launches itself bravely into the air from the nest box.

PHOTOGRAPH BY DANIEL GRICE, MASSACHUSETTS DIVISION OF FISHERIES AND GAME

nests are not disturbed during the critical incubation period. Their breeding range covers most of the United States and much of southern Canada. Information as to whether or not they nest in your locality can be obtained simply by writing to the State conservation department. Many of these agencies have printed instruction sheets for persons interested in helping these beautiful birds to survive.

Nesting boxes can be made from a variety of inexpensive materials. Construction of a suitable box requires observance of a few simple details, and no special mechanical skills are needed. One of the most successful models can be knocked together from scrap one-inch lumber. It is 10 inches square, 16 inches deep, and has 4-inch entry hole cut through the upper front side. A snug-fitting piece closes the bottom and the box is topped with a sheltering roof board.

An inch or two of clean wood chips should be sprinkled in the bottom of the boxes. Ma wood duck will supply the rest, soft down feathers from her breast and the eggs, creamy white and from 10 to 15 in number.

The boxes can be fastened to bank-side trees, but the best site is on supports that are surrounded by open water. This foils raccoons, which have an appetite for duck eggs, and also prevents ambitious squirrels from filling the box with leaves and twigs. The boxes should be raised at least three to five feet above high water levels, in places that are clearly visible to the birds.

Shortly after emerging from their shells, the ducklings, clinging vigorously to the soft sides of the box with their sharp-clawed toes, follow their parent to the opening, and flutter down lightly to join the rest of the brood. The young birds often return the following year to the locality where they were reared, repaying with their beauty the hospitality they receive.

Persons interested in increasing the numbers of wood ducks, regardless of purpose, can expect good results through the use of nesting boxes. These birds are limited in many areas by the lack of nesting sites, and suitably placed boxes are certain to get their share of attention.

Siesta

By THEO. H. SCHEFFER

The desert noon with drowse is filled,
its breeze dole spent;
From tenting sage the heat is spilled
with pungent scent.

Insistent flings the Robber-fly
his challenge brisk;
As flash of light that shuttles by,
like Basilisk.

In crackling flight the Locust stirs
colliding wings
And shriller yet, in rhythmic whirs
Cicada sings.

Unsteady swims the skyline there
where basalt breaks—
Why waste in sleep the sentient air
while desert wakes?

Shall We Save a Home on the Range?

By WALLACE G. SCHWASS

U.S. Fish and Wildlife Photographs

A pronghorn antelope buck surveys his realm of the wildlife refuge.

COMING up from a long draw, you climb a high rise in the north-south dirt road, then suddenly see spread to your right southeast Oregon's most spectacular sight. This is an 8000-foot rock ridge stretching for miles along the eastern side of the Warner Valley, a continuous cliff dipping into a string of lakes and lifting its far-flung head to clouds that feed its numerous springs and streams. Even as you skirt Crump and Hart Lakes in autumn, frightening flocks of ducks and geese from the tules, you can see gigantic canyons that gash the monstrous headland. Passing between Anderson and Flagstaff Lakes, whose shore waters are rich with avocets and grebes, you climb up the steep face of the escarpment with plenty of time to sweep your binoculars over Bluejoint Lake, northernmost of the string, to identify those distant white specks as pelicans.

You reach the summit, and have arrived, for this is Hart Mountain, green oasis in the desert, and a Federal antelope refuge. From the heights you can see a major part of the 240,000-acre reserve. It stretches away in every direction to the abrupt base of the mountain behind you, and towards the east, where the mountain gradually fades away into the desert.

The stone-built refuge headquarters is not far away, and here you may transfer to a jeep, which takes you over rough terrain to a hot spring trapped in a pool within a wooden shield. After a quick outdoor bath, you climb to the highest parts of Hart Mountain. On the open stretches bands of curious antelopes race to cross the road before you, and you learn that the animals have already started to drift southeastward down into Nevada. Hart Mountain is their summer home. There the young are dropped and the "herds" are later formed as the waterholes begin to dry up. In the fall and winter these graceful speeders move southeastward to another area that has been set aside as a winter sanctuary—the Charles Sheldon Antelope Refuge and Range—in northwestern Nevada. The migration is a short but a vital one.

At one time this extensive range held a herd of some 10,000 antelopes. Today, despite protection and the necessary habitat, the entire group numbers only 3500. Disturbed by the failure of the animals to come back to the carrying capacity of the range, the State of Oregon, through its University, has sent biologists to Hart Mountain to conduct a long-range research program to determine what is restricting the expected increase.

These biologists are not only eager to point out the antelopes on the sage flats, and the mule deer in the aspens and ponderosa pines scattered about the mountain, but they take you to a pasture where twenty-five Rocky Mountain sheep from British Columbia are being acclimatized to the mountain before their release. This is an attempt to restock the mountain with wild sheep. At one time the rimrock bighorns, *Ovis canadensis californiana*, were found in large numbers in the area, but long ago they were shot out.

Antelopes come to water on the Charles Sheldon Antelope Refuge in Nevada, where most of the pronghorns from the Hart Mountain Refuge come to winter.

As you hurry back to headquarters, you note that sage hens seem to be everywhere, but that there is a noticeable lack of coyotes. This animated voice of the West is hardly heard on Hart Mountain these latter days.

The desert road connecting Hart Mountain Refuge with the Sheldon Refuge in Nevada is primitive—crossing a hard, dried lake-bed at one place—and lonely. At the end, you climb another mountain on whose peak stand the stone buildings that serve as headquarters for both the Charles Sheldon Antelope Refuge, a sanctuary of 34,000 acres, and for the adjacent Charles Sheldon Antelope Range, a 548,000-acre spread of deserts, valleys, headlands and hills. It is here that most of the antelopes in this herd spend the winter, scattered over the barren landscape. Even now, as you drive to Virgin Valley in the heart of the Range, many have gathered on the dry reservoir beds to eat primroses. Once you are spotted, they scatter, streaming away over the open landscape like driven snow.

Virgin Valley is considered by some Westerners to be the most real bit of the West left in America. Here you may encounter many parties of "rock hounds" searching for opals and carnelians, which are found in isolated pockets about the local terrain.

Sitting in the cold around a Virgin Valley campfire with several members of the Order of the Antelope, a private organization dedicated to perpetuating the pronghorn, you are surprised to learn that the Hart Mountain and Charles Sheldon refuges are rather recent in origin; that they are North America's only refuges specially dedicated to the antelope.

During the depression years there was deep alarm over the decline of the antelope. With the Order of the Antelope spearheading the drive, and donating money and land, conservationists urged the creation of the Hart Mountain sanctuary. At the same time, Audubon societies, the Boone and Crockett Club, Charles Sheldon, and many organizations and individuals campaigned and gave money and lands, until the two contiguous Charles Sheldon areas were officially set aside. The major purpose of these refuges was to save the remnant of antelopes still there; to build it back to a 10,000-head herd, and preserve this herd for all time, so that Americans could always come from any corner of the land to see what a bit of the original West was actually like. In a sense, the two preserves serve one large herd, and really may be considered as one sanctuary split into two parts.

The final plan still remains to be evolved. Of primary concern to all is the investigation presently being conducted by the State of Oregon. This must and will be continued until the causes are found, and a positive rehabilitation program can be built from this information. The Federal Government has been criticized for failure to send biologists into this area when it became known that a serious problem existed. Instead, a professional hunter was dispatched to Hart Mountain to trap and kill predators, although coyotes were already exceedingly scarce and were valuable in holding in check the rodents that feed on the eggs and young of the sage grouse.

Everyone is wishing the State of Oregon success in its attempt to restore a related species of mountain sheep on Hart Mountain, to replace the extinct rimrock bighorn. There is some hope, also, that a small bison herd may be established on the eastern range of the Hart Mountain Refuge. Once the bison roamed these flats.

Several important physical improvements have been suggested. It is proposed that a Sage-Brush Institute, housed in a large stone building at Hart Mountain headquarters, be established as soon as possible. This Institute would be dedicated to research on sage-brush,

"Rim of the World" is the title of this scene in the Hart Mountain Antelope Refuge in Oregon. From this height one looks down from Hart Mountain to Warner Valley, 3400 feet below.

and those mammals and birds dependent upon it for their existence. Scientific knowledge and timely publications, both for the scientist and layman, could result from such an undertaking. The general public is not aware of the significance of sage-brush habitat. It is too widely believed that all lands supporting this shrub are worthless, as a national publication recently stated in announcing a general program for the Bureau of Reclamation. When the sage flats go, so will the antelope and the sage grouse. If commercial uses could be developed for the plant, its future might be assured. Very few people know that some of the best honey in the world is sage-brush honey. If the Institute could produce a George Washington Carver to do for sage-brush what he did for peanuts, it would gain world renown. To date, this shrub is an important natural resource whose value has been totally ignored.

A stone-built museum with its camping ground are badly needed at Hart Mountain headquarters. The museum should be dedicated primarily to the antelope, and all exhibits presented simply, but with drama, as the National Park Service has done with its Plains Indian Museum at Browning, Montana. The sage grouse, sage-brush, and local Indian artifacts could play a minor part in this project.

The hot springs might be turned into two pools, one for bathing and one for swimming. The U. S. Forest Service has set a fine example of such development with its Juniper Springs in Florida's Ocala National Forest.

Two camping grounds—one at headquarters and one in Virgin Valley—, and a museum at headquarters, are needed at Sheldon. The museum could also be a focal point for the rock hounds, with exhibits of opals and carnelians.

Present ownership is a checkerboard of State and Federal plots. Some feel that this area of the string of lakes west of Hart Mountain would make an excellent State park, a sort of gigantic welcome mat to the antelope land immediately beyond. Equipped with a truly western lodge, such a park, and the adjacent antelope ranges, could become as internationally famous as the Black Hill's Custer State Park.

As you stir the last embers of the late fire, some one comments that more and more visitors are discovering antelope land. With a growing population, this desert country, dominated by a green oasis, will assume an even more important aspect within a period of only a few years.

A full moon lights your way to your sleeping bag, and there is a contented feeling deep inside yourself as you crawl down into its warmth and realize that here in America such things can come about.

Dragonflies Migrate, Too

By HOWARD J. SHANNON

Illustrated by the Author

There, high above, advanced the northward-moving procession of migrant dragonflies.

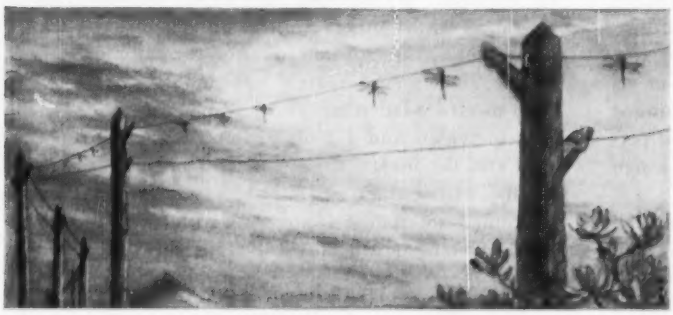
IT SEEMS strange that the impressive spectacle of a great swarm of dragonflies flying over the country in a definite route could have remained so long an unsolved puzzle. Yet such was the case, both here and abroad. British entomologists failed to recognize the true nature of many insect migrations. One of them, Dr. J. W. Tutt, declared in 1899 that, after an extensive survey of entomological literature, he could find no resemblance between the regular seasonal migrations of birds and the sporadic migrations of insects. He attributed insect flights to particular conditions of the moment, and the dragonfly flights to a scarcity of food.

Some European entomologists believed, however, that the simultaneous emergence of great numbers of adult dragonflies from the earlier larval stage aroused this remarkable flight instinct. Others assumed that the drying up of some pond caused an extraordinary exodus. This latter theory was accepted by the late Dr. Leland O. Howard to account for a great flight observed by a Mr. Mundt in Illinois, and he assumed a similar reason for other dragonfly flights.

My own introduction to this impressive spectacle was unexpected. One quiet September afternoon on Long Beach, Long Island, I was watching the struggles of digger wasps. Happening to glance upward, I saw a great swarm of the large, glittering-winged dragonflies advancing from the east. They were flying at a height of about thirty feet above the beach, moving in a steady, undeviating flight toward the west. Wave upon wave, they came! I watched these flooding multitudes for two hours, and when I left the beach, these hastening winged throngs were still flying toward some unknown, mysterious goal in the west.

"What was the cause," I asked myself, "of this remarkable mass movement; this apparently predetermined flight in one direction?" The customary explanations just did not satisfy. And later observations along the Connecticut shore and on the southern shore of Long Island, showed that such dragonfly flights were annual, late summer, events. True, they do not make headlines and are often far from spectacular, but there was no question of their seasonal dependability.

Perhaps, I reasoned, these east-to-west flights were only sidewise diversions of a more extensive movement toward the south. An intensive survey of entomological literature, published both here and abroad, uncovered convincing evidence that this was, indeed, the case. Certain species of dragonflies migrate southward in autumn, much as do many species of birds. This conclusion, with supporting evidence, was published in *Harpers Magazine* for September, 1915, and in September, 1916, issue of *The Scientific Monthly*.



Sleeping postures of dragonflies as they cling to a telephone wire at twilight.

That there were complementary spring flights to the north seemed a strong probability, but records in this country were almost non-existent. But Old World literature contained convincing and profuse records, particularly in Germany and Russia. And this evidence, too, was advanced in the already mentioned publication. They showed that the mid-European flights seemed to take place in May, while, farther north, most of the recorded migrations occurred in June.

Thus it seemed certain that such northward spring flights of dragonflies must also occur in

this country. Moreover, our conception of this seasonal interchange between north and south, somewhat in the manner of the bird migrations, could not be considered complete until such flights were discovered—and described—on our own continent. Foreign data suggested that a likely "flightway" might be found in the neighborhood of Long Island and northern New Jersey in late May, or about mid-June.

The northern coast of New Jersey had already proved to be a strategic spot for the discovery of northward-moving migratory butterflies in spring, (*Nature Magazine* for May, 1954), so it held great promise for the dragonflies, as well.

So, on May 22, 1920, I made a base at Port Monmouth, in a coastal shack hardly more than twenty-five feet from the shore of Sandy Hook Bay. If my calculations proved to be correct, the winged travelers should pass almost within arm's reach of my door.

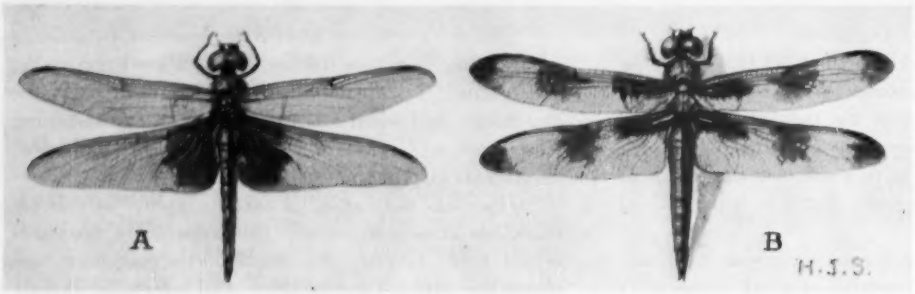
Soon the vanguard appeared, occasional individuals flying westward along the shore. At intervals, one of these large dragonflies would turn aside, and dart directly northward over the water. By June 14, a number of our largest dragonflies, *Epiaeschna heros*, had been behaving in this manner. And one day, while I was clamming two hundred feet from shore, one of them flew directly past me, and continued far out over the water, toward the northeast, until lost to sight. But these were only suggestions of the anticipated flights.

How thrilling, then, was the true advent of that marvel I had waited so patiently to see; the day-long mysterious migration of the spring dragonflies! By 8:30 on the morning of June 15, party-colored heralds of the flight were drifting past my door. The banded-winged *Libellula pulchella* was among them, the brown-spotted *Tramea lacerata*, and the great *Epiaeschna*, too. One *Tramea*, finding a twenty-foot-high shed in its path, promptly rose to surmount it, then continued on in the undeviating flight, and with obstinate persistence, in a determined course that is so surely a sign of a true migrant.

Whether these westward-moving insects represented actual migrants, however—those that already had moved up the coast from the south only to be diverted sidewise by this coastline—could be definitely proved only by first-hand observation. So I proceeded to investigate. Walking half-a-mile inland, where, incidentally, the obstacle of a line of tall trees was typically overcome by six of our largest dragonflies as they rose in westward flight to surmount them, I awaited a trolley-car bound for the Highlands. There the northward flight up the coast should be revealed. And since the wind blew from the southwest, I felt that, at the Highlands, the drift of the migrants should be toward the actual shoreline, and thus add to the spectacle. I was right.

Straggling companies of the three species were moving up from the south, and then following the broken coastline westward. By 11:30 A.M. the movement had attained even greater proportions, for the golden-winged *Libellula semifasciata* had joined the procession. Another quite different insect, too, a wasp, *Campsomeris quadrimaculata*, seemed moved by the same overwhelming instinct, and became a not uncommon participant in the flight.

By 1 P.M. the movement had become so slack that only an occasional dragonfly passed. Some of them were individuals that, having been driven seaward by the wind, had then struggled back to land to rejoin the safer procession there. Then the wind shifted to the south. Had the movement entirely ceased?



Two other participants in the great flight of June 15 were (A) *Tramea lacerata* and (B) *Libellula pulchella*.

No! I had failed completely to realize the flight's sensitive response to a meteorological change. As darkening storm clouds drifted up from the southwest, and a slight drizzling rain began to fall, I glanced upward. There, far above me, moved the supposedly absent dragonflies. Some flew 100 feet above the shore, others moved at greater heights, even 250 or 300 feet in the air. All were heading steadily north, undeterred by the rain. Twenty-one individuals were counted at a glance. Still others were coming from the south. There was no interruption to the onward moving throng.

The flight's continuance was doubly impressive in such moisture-laden air. For, although not heavy, the rain increased and I took shelter on a nearby porch. And still the insects came, but now only in infrequent groups, rather than as a steady procession. Yet they continued to emerge from the darkling south and to drift mysteriously northward amid the gently falling rain.

Then the shower abated. Patches of blue sky appeared in the north. Only an occasional rain-drop fell, and only an occasional flyer headed past. Complete

cessation now seemed not far away, and the inner man demanded attention. It was quarter to six when I answered that demand at a nearby restaurant.

But long experience had forewarned me of the unpredictable. So I took my refreshments to an outdoor table available to an eccentric who preferred to eat alone in the again lightly falling rain. The migrants

The great dragonfly flight of June 15, as described here, is indicated by the lozenge-tipped arrows. Dash line, with small arrows, indicates author's route.

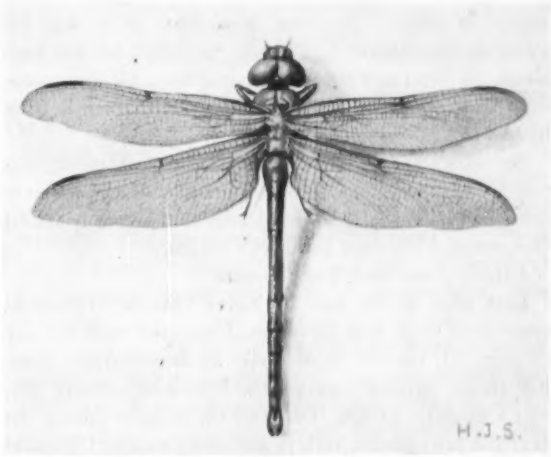
were once more on the wing. Some flew only thirty feet above the shore, others hawked about the roof's eaves for prey. But the great majority ascended to loftier levels and, high above the Sandy Hook peninsula, continued on their northward way. How steadily new visitants from the south moved forward in imposing array! How wonderful, indeed, had the spectacle now become to an appreciative eye! These dragons on migration *are* incited by some inner necessity; some deep biological impulsion. This is so baffling and profound that it becomes a challenging problem that the entomologist must evaluate and define.

Dusk was not far away now, but as I awaited a trolley-car below the twin lighthouses, an occasional large dragonfly darted swiftly past. It was eight o'clock and I was half a mile from the shore when Port Monmouth was reached, and heavy clouds, hanging low in the north, emphasized the sultry atmospheric blanket. But now came another surprise! Five feet above my head, and half-obscured by the murky air, drove a steady stream of the largest dragonflies! They moved, as their forerunners of the morning had done, parallel with the shore, that is, toward the west. Soon, in the gathering gloom, these belated migrants became almost invisible, yet they drove violently forward, and almost streaked through the air, in their hasty, direct and arrowlike flight. How much later into the night they flew I do not know.

The following morning the dragonflies, in sparse numbers, were again on the wing. So our country *does* witness the northward movement of these insects in spring, even though the flights do not reach the spectacular proportions of those swarms that have been reported, again and again, in their truly portentous advances over the European continent. One almost incredible report states that the noise of the insects beating against the windows of a girl's school caused the dismissal of classes for the day. Hence country folk abroad looked upon these visitations as warnings of a coming pestilence, or a threatened war.

One should not wonder at this, for reliable answers to puzzling problems in the world of Nature have been difficult to obtain. So fear, rather than intelligent observation, has played too frequent a part in the interpretation of the reasons for the ways of life among Nature's creatures.

So slight are the records of these significant spring



By June 8 the first individual migrants of the large dragonfly species, *Epiaeschna heros*, were drifting westward along the shore.

migrations that I must add some further data. On both June 18 and 20 an undoubted movement occurred, and, on June 22, at Highland Beach, a steady south-to-north procession was seen. It lasted from 10.57 A.M., when I arrived, until 3.45 P.M. when observations were concluded. But only one more notable manifestation was seen before the migratory season in that area seemed to draw to a close. On June 29, with an early southeast wind shifting later to south, a rather steady procession of the three principal species swept past my cabin from 10.30 A.M. until 12.57 P.M., when observations were discontinued. A heavy wind and rain obscured all further efforts on that day; but it is not improbable that lesser flights may continue, even into the first week of July. Perhaps others will be able to add more to our knowledge of dragonfly migration in our country. Much needs to be learned.

★

"Geronimo's Face"

By WELDON F. HEALD

Photographs by the Author

WHEN things go wrong in the Chiricahua Mountains in Arizona's southeast corner, as they often do, people shake their heads and mutter, "It's the Curse of Geronimo!" As a newcomer to the country, I never put much stock in this local superstition, but something I ran across last year makes me wonder. Perhaps there is more to this than mere legend.

Geronimo, last battling chief of the savage and warlike Apache Indians, was captured by General Miles' troops in 1886. The story goes that, as he was led away to banishment in Florida, he raised his fist high above his head and shouted a curse upon his lost homeland, and upon the white men who had stolen it from his people.

So no longer are these lofty, timbered mountains the dread stronghold of the Apaches, but the malevolence of this ruthless Indian leader still seems to haunt their rugged canyons and rocky ridges.

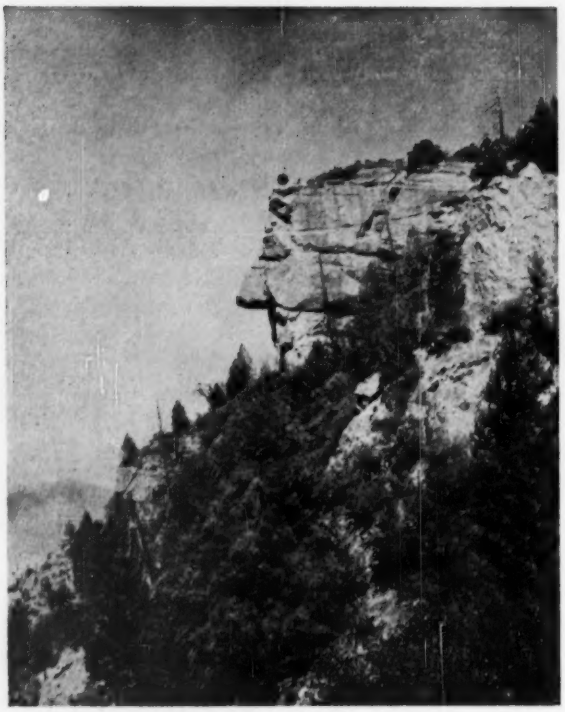
I think I discovered the reason.

Last year, on the way up Silver Peak, a Chiricahua summit of 8020-foot elevation, I stopped near the top to rest. I turned, then gave an involuntary start. For there, outlined against the blue southwestern sky, was a gigantic profile of an Indian, stolidly gazing out over the tawny hills, valleys and deserts three thousand feet below.

"It's Geronimo!" I exclaimed aloud.

Nobody had mentioned this great stone face, and it was apparently unknown to the local inhabitants. Yet it stands in plain view from a trail and is so perfect in all its details that it would be celebrated in a more populated region. Perhaps it would be as famous as New Hampshire's famed Profile.

Here on the edge of a cliff, Nature has carved through the centuries a profile four times larger than the man-made faces at North Dakota's Mount Rushmore Memorial. Standing two hundred and fifty feet from chin to top of head, it is complete, with nothing skimped, caricatured or left to the imagination. There is a mouth, an eye and a great jutting nose, while the wrinkles around the mouth, cheeks and eye are startlingly lifelike. In outline the profile resembles that of a brooding Indian, the likeness being doubly strong because the rock is a warm, red-brown, latite lava, almost the exact color of an Indian's skin.



This great stone face, high in Arizona's Chiricahua Mountains, gazes stolidly out over the tawny hills, valleys and deserts 3000 feet below.

I stood fascinated. The silence was complete and the ageless stone face cast a somber spell over the place. Sense of time and space was lost and there was a strong and immediate awareness of those fearless, mysterious red men who once roamed these wild mountains. The feeling was of awe, closely akin to fear.

I do not know how long the spell lasted, but it was suddenly broken by a scolding chipmunk in a nearby tree. But as I plodded up the trail once more the thought struck me that maybe the Curse of Geronimo was not a myth after all. Perhaps the Great Spirit of the Apaches had turned him to stone and set his face high in the Chiricahuas to look over the lost land of his tribe and harass the white intruders through eternity.

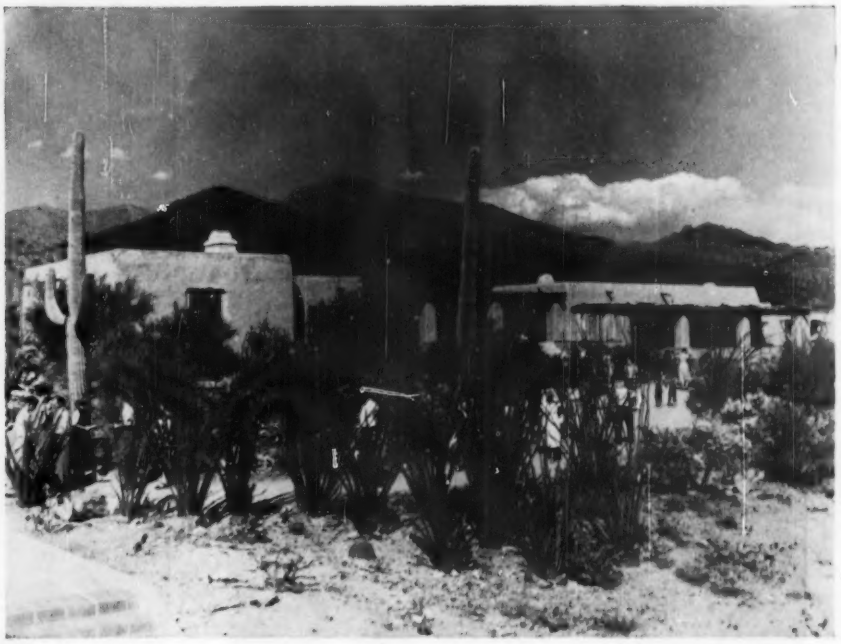
I would not want to vouch for this—but it could be.

Mouse

By ETHEL JACOBSON

A scamper,
A squeak,
A silver-furred
Streak—
Wee tenant,
The mouse
Who shares
My house.

Museum of the Desert



Main building of the Arizona-Sonora Desert Museum, with a part of the Nature trail in the foreground. Bordering the trails are specimens of a wide variety of growing things of the desert regions.

AFTER surviving the usual storms that beset such undertakings, the Arizona-Sonora Desert Museum has arrived at maturity. Heretofore supported largely by the Charles Lathrop Pack Foundation, through the American Nature Association, and under the leadership of the Association's President emeritus, Arthur Newton Pack, it has now become an independent, self-sustaining enterprise. With no government grants or subsidies, it will be operated as a non-profit show-place of Nature as found in the Sonoran desert regions.

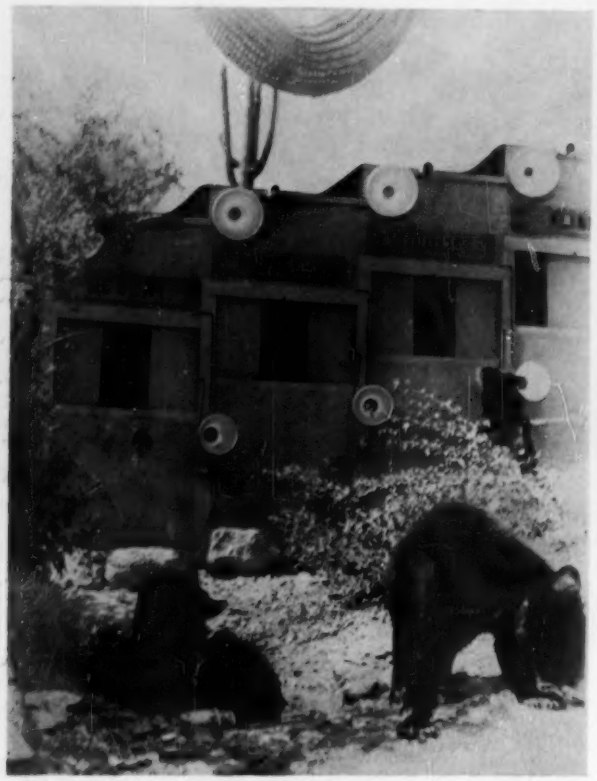
Since the doors were first opened, on Labor Day, 1952, more than 300,000 persons have visited the large adobe lodge, and adjacent grounds and buildings in which the live and other exhibits are located. An average winter Sunday brings two to three thousand visitors.

During the week, school and university classes use the facilities to further their studies. The museum is swamped at times with the visiting youngsters, who have adopted George, the mountain lion, as their special favorite.

George, collaborating with a ghost writer, conducts a weekly column in a local newspaper on the events at the museum. His comments have helped make it an integral part of Tuscon community life, and visits to the museum are proudly recommended to Arizonans and visitors from afar.

Various aspects of the museum have been featured in magazines such as *Time*, *Life*, *Newsweek*, *Arizona Highways*, and many others. It has been visited by and received contributions from several film companies making natural history films in the Arizona area, including the Walt Disney troupe that filmed "The Living Desert." Its methods and unusual content have been applauded in

The view from the main lodge of the Museum, looking out over the exhibits of larger mammal life of the Arizona-Sonora Desert areas. These are live animals. In the distance is the broad desert valley and, farther distant, the Baboquivari mountain range.



For the wildlife photographer a permanent photographic "blind" has been provided, with lights illuminating the spot to which come various animals. Here three bear guests are out for a stroll.

Special effort has been made to encourage youngsters to become familiar with and unafraid of desert wildlife. As a result, some of the animals in the area are losing their fear of human life.

scientific circles, and by people in the museum field.

Recently, the Governor of Sonora was a guest at the museum, voicing the sincere desire of his government to assist in thus spreading knowledge of the great Sonora desert lands. With this avenue of international cooperation opened to the staff, the scope of the museum can be even further enlarged, and educational objectives attained.

During its brief existence, the project has never ceased growing. Donations of specimens by local groups and the acquisition of others by the staff have continued steadily. After a visit by some of their members, the Tuscon garden clubs volunteered to erect a beautiful ramada in which models of the flowers of various cactuses are shown. Small boys, elderly ranchers, and Papago Indians are

Among the animals photographed from the blind has been this group of wary javelinas, or peccaries.

Just outside the Museum grounds are found the picture writings of the Hohokam, the People Who Disappeared. A student is trying to determine the meaning of the writing.

Laboratory facilities serve to permit study of desert life and a place to work with the material for the exhibits. Here William Woodin, III, new director of the Museum and a herpetologist of note, prepares some specimens for display.

among many who have offered aid to increase the scope of the museum. Thus the endeavor becomes truly a community matter.

This spirit of helpfulness has created problems at times. The moderator of the bi-weekly television show featuring the museum, after casual comments on the need for animal specimens, found himself with various odd desert denizens contributed by enthusiastic youngsters. The moderator's wife patiently tends the curious menagerie between shows, or until the animals can be placed in the museum.

All the exhibits described in earlier issues of *Nature Magazine* have been completed, and many more. Among the seldom-seen live desert fauna, on display in natural surroundings, are mountain lion, javelina, gray fox, chula, ring-tailed cat, and a variety of smaller life ranging from Gila monsters to kangaroo rats. These smaller mammals have proved to be the hit of the museum, being more rarely displayed than the larger mammals.

An indication of the regard for the museum is found in the fact that not a single case of vandalism has been reported. Indeed, the enthusiastic acceptance of the project convinced the Board of Directors that the initial financial support, having given a sound start to the museum, could be withdrawn without endangering its continuance or growth.

Although mineral specimens are not available for collection within the Muesum area, many amateur mineralogists have cooperated to gather specimens for exhibition in the Museum.

When one approaches the Arizona-Sonora Desert Museum from Tucson, one passes through magnificent and interesting stands of the saguaro cactus, some of which grow in the Museum's garden.

A measuring stick stands beside this rapidly growing desert plant to record its phenomenal progress.

School classes make particular use of the Museum and its garden. Instructors accompany each group of visiting youngsters to explain the legends with which all of the many kinds of plants are carefully and simply marked.

Under the new program, a modest admission fee is charged, various types of memberships in the Museum Association are sold, and individual or group donations received. With the broadening interest in the Desert Museum, attendance alone is expected to provide adequate funds for its support as it stands.

William Woodin, III, is the present director of the museum, its founder and former head, William H. Carr, having been forced by ill health to resign during October of the past year. The staff is well trained in coping with the tricky problems of conducting such an informal, natural history observation post. So, endowed with enthusiasm and a propitious beginning, together with the gratifiying growth of interest being evidenced by the general public, the Arizona-Sonora Desert Museum is certain to continue and prosper.

One of the most popular spots in the Museum is the small animal room, which houses live exhibits of reptile life and of the small burrowing animals.

Mushrooms Take Their Own Pictures

By TOWNSEND GODSEY

Photographs by the Author

1. Be certain that the paper on which the spore print is to be made is considerably larger than the mushroom.

2. Use a sharp knife to remove the stem from the mushroom so the cap can lie flat on the paper.

THE NEXT time you feel tempted to give yourself a verbal pat on the back for some fancy snapshot you have just made with your new camera, perhaps equipped with its high-speed lens, fast film and electronic flash, consider the mushroom. It may be that you will not feel so clever, for the mushroom can take its own picture. It can do so in detail as fine as any super-grain film you ever dunked in the "soup," too.

If you are like most folks you probably find it difficult to think of flowerless plants, like the mushrooms, as plants. In fact, many people do not think of them at all, unless they are on a steak, or in a poultry dressing. But just because these funguses have no green parts, early observers of growing things hardly knew what to think about the mushrooms. So, not understanding these plants, they built superstitions around them and gave them much attention in folk lore. Fairies danced on them, the stories said; toads sat on them; Brownies used them as umbrellas; witches—bless their little black

3. Lay the mushroom cap downward on the paper so the spores can fall evenly. The paper can be coated with thin muscilage, or egg white, to hold the fallen spores.

hearts—used them to spice deadly potions. But nobody knew then that the mushroom was a photographer, capable of making its self-portrait.

If you are skeptical of the mushroom's ability as a kind of Steichen, a Bourk-White, or Steiglitz, just let us show you what it can do. The results will be surprising, and you will

have a delicate picture for your herbarium or portfolio. You may even want to put it under glass, or in a frame.

The procedure is simple:

Take a freshly opened mushroom, cut off the stem right down to even with the cap. Then set the cap, gills down, on a sheet of paper, which may be coated with thin mucilage, or with egg-white. Cover the mushroom with a cup or bowl and leave it this way for twenty-four hours. Then remove the cover, carefully lift the cap and see the picture.

Millions of minute spores, which are not seeds but do for mushrooms what seeds do for other plants, make up the picture. One grain of spore could start a new growth of mushrooms, they are that potent.

Sometimes more than one print can be made with a single mushroom cap, but sharpest relief is given from the

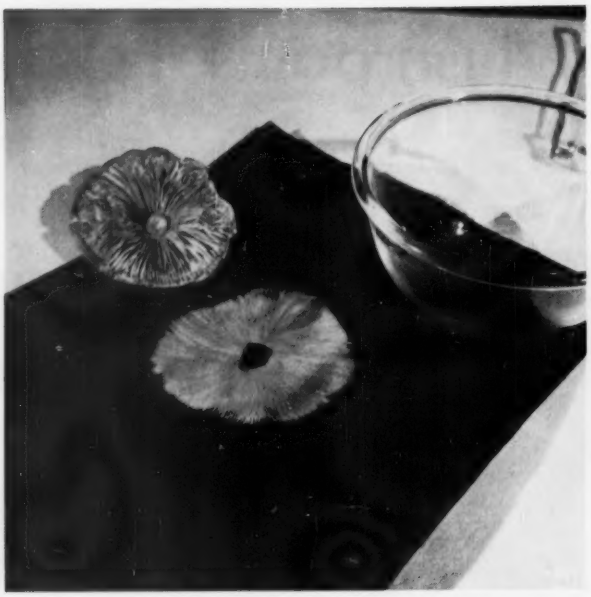
4. A cup or bowl is set over the mushroom cap to keep the cap in place and to prevent air currents from disturbing the spores.

first self-portrait.

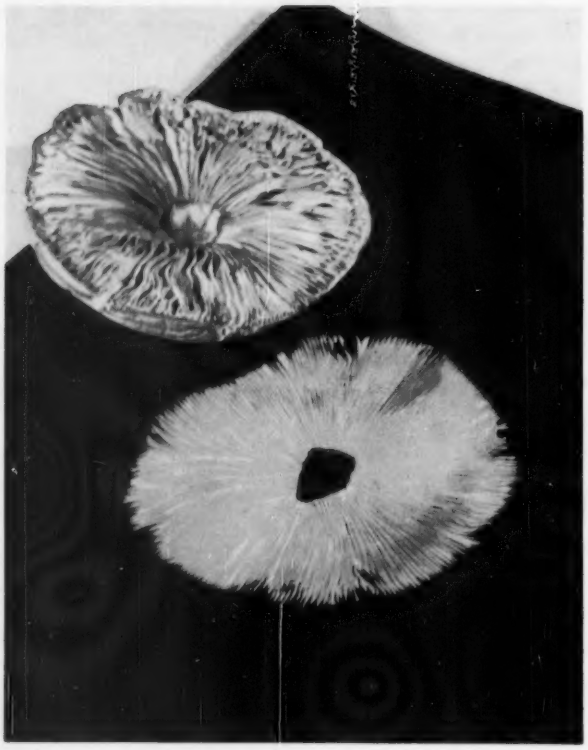
The print can be preserved by carefully spraying it with artist's fixative.

The paper used may vary with the kind of mushroom, which may have spores varying from white to black, and including pink and a rust-colored brown. Thus a black or a dark-colored paper may be used for some, and a light-colored paper for others. Since no mushrooms have blue spores a paper with a medium-blue tint may be used advantageously.

Preserving mushroom specimens is more difficult than with many plants. Hillcourt, in his *Fieldbook of Nature Activities*, suggests that the specimens be spread on a piece of cloth over an open rack. They should be slow-dried, so an oven should be set at its lowest heat, the door kept open and the heat kept between 130 and 160 degrees. Once dried, the specimens may be kept in cellophane envelopes, or flattened a bit and mounted on regular herbarium sheets or special cards.



5. After from one to several hours the cover can be removed and the mushroom cap carefully lifted.



6. The minute spores drop from the cap upon the paper base. If the paper has not been coated with mucilage or egg white the pattern can now be "fixed" by spraying it with fixative.

Eastern Kingbird

Photographs and captions by T. C. Van Alstyne

Meet the eastern kingbird. Its scientific name, *Tyrannus tyrannus*, suggests its chief characteristic because both birds, male and female, meet all intruders with beak and claw. Driving crows several times their size from their orchard bailiwick is mere play for them. Even humans will sometimes be dive-bombed if they venture too near the nest.

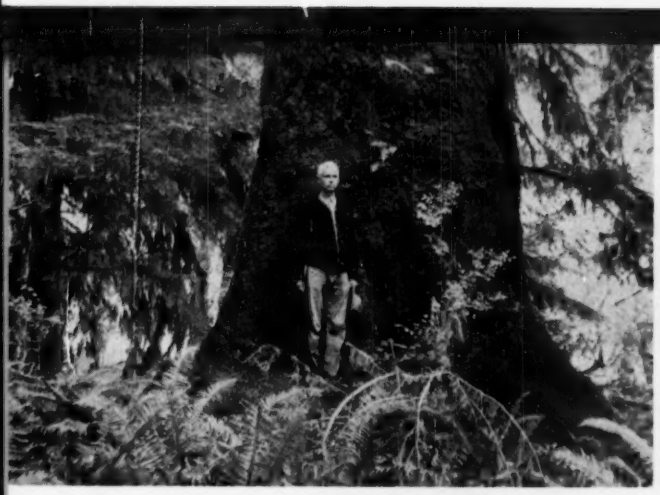
(Above) A bird of haughty beauty, the male keeps a watchful vigil on a twig. Close observation is necessary to distinguish him from the female but, as with most birds, his coloring is slightly brighter, and he will be recognized as the lord and master by his activity. He seldom shows the red crown feathers so often printed on color plates.

(Right) Slightly smaller than the robin, the kingbird is gray and white, and in June usually lays four eggs, cream-colored with brown blotches. Among its favorite nesting sites are the orchards of southern Canada. Their presence, in spite of their sometimes noisy swashbuckling, should be welcomed, for they discourage hawks and other predators.

Once laid, tending the eggs becomes a full time occupation for the female. Carefully turning them with her beak at intervals, a process apparently necessary to insure their even incubation, is a part of the job. Only in warm weather can the eggs be left unattended for any long periods. The bird then takes full advantage of the occasion to feed.

The great day arrives when the shells break and the small, feathery heads appear. Helpless when first hatched, the young birds rapidly gain strength. From the first, Nature blends their color with that of the nest and the youngsters are barely discernible, especially to the black and white camera. Both birds are active in the care and guarding of the young.

An astonishing amount of food goes down the throats of the fledglings during their early development. In the nest two weeks, or longer, before making their first flight, from which they never return to the nest, they gradually develop the feathers that make flight possible. The first attempt made by the birds shown in these photographs took them safely across the road into an elm tree.



A great Sitka spruce beside the Bogachiel River trail, inside Olympic National Park but close to the boundary. (Above, right) The Bogachiel River trail, a short distance inside the park and in a mixed forest of Sitka spruce and western hemlock; typical rain forest growth. (Below, left) On the Bogachiel trail just outside the boundaries of the Park, after "selective cutting" of spruce and hemlock by Rayonier Corporation under contract with the U.S. Forest Service. (Below, right) "Selective cutting" by Rayonier in Bogachiel Valley, a few rods outside the Park boundary. This represents the "preservation of natural beauty" achieved by purchasers of government-owned timber.

The Predatory View

APPEARANCE recently in several magazines of national circulation of a two-page color advertisement by Rayonier, Inc., a corporation specializing in cellulose chemistry, aroused conservationists. Rayonier announced a forestry program for 1955 with which no one could quarrel. Then it added its bit to the attack upon the integrity of our National Parks—an attack that comes these days from various interests that covet the natural resources within those public areas.

"We are frankly critical," says Rayonier, "of national policies which permit trees to reach maturity, die, topple over and rot. This is now happening in many areas.

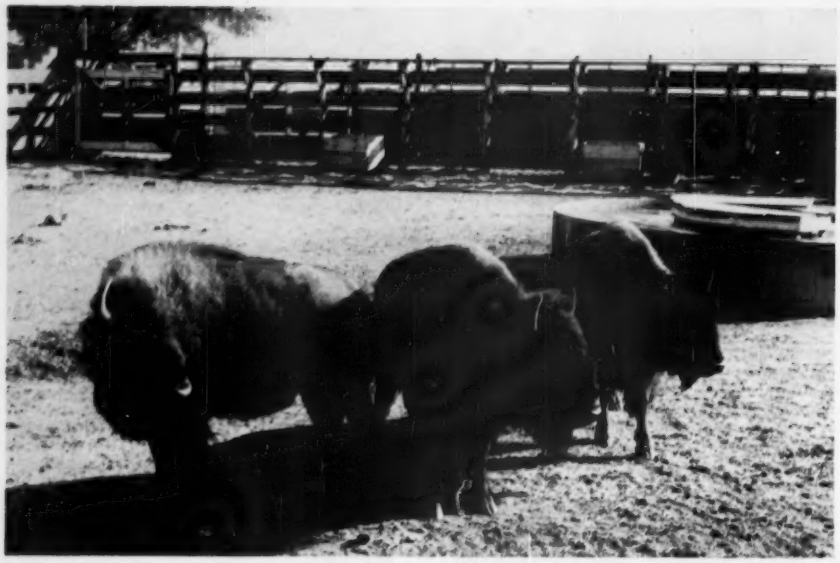
"In the Olympic National Park alone, millions of board feet of prime timber are needlessly lost each year—the unwitting result of laws enacted to satisfy ill-advised pressure groups in search of a 'worthy cause.' "

Such an absurd statement reveals, of course, complete ignorance of the history of our National Park System, the sound philosophy upon which it is based, as well as a lack of understanding of the recreational, spiritual and scientific significance of the *natural* character of these areas. It comes as a shock to realize that, in 1955, a corporation of the importance of Rayonier would, in its advertisement, subscribe to such a paragraph as the following:

"This useless tieing-up of park lands has choked the economic growth of many communities; actually penalized citizens from realizing their economic heritage; made no contribution to wild life or people who love the woods."

Such a statement should be a warning to the American people; a sign to the more than 40,000,000 who visit the areas under the National Park Service annually that predatory forces are abroad.

Above are pictures, taken by conservationist Irving Brant, showing scenes along the Bogachiel River trail, just inside and just outside the boundaries of Olympic National Park. Those inside the Park show the virgin rain forest, untouched by lum- (Continued on page 220)



Before being run through a fenced chute to be shot with high-powered rifles, the bison were corralled and then released for slaughter in small groups.

Tragedy at Huachuca

By FRANK A. TINKER

Photographs by the Author

I ATTENDED a political execution. There was an Arizona range, shining gold to the horizon. Coverlets of sparkling snow lay on the timbered hills around us. The very ground was a Federal area, but, notwithstanding its setting, the tragic affair was as completely confused as those pogroms that accompany other conflicts of political groups.

By the time these words are read Arizona's largest herd of buffalo, numbering 220 head, will be gone. They will have been "harvested," as it was glibly put by one of the factions. The word is an inept description of the procedure by which these very symbols of America were exterminated, however. A harvest implies a certain amount of honest work on the part of the grower, and a continuing renewal of his crop through his efforts. In this case, instead of even an honest slaughter, an attempt was made to provide "sport."

Bison had been pastured on the many thousands of acres of unused range of Fort Huachuca, at present an electronic proving ground for the Army. They were rounded up in groups of ten or twelve to meet their fate. In the morning they were herded into a corral. Then, as the carcasses of their predecessors had been hauled away to the skinning racks, they were released into a fenced chute where the "hunters" were waiting alongside with big-game rifles. It was somewhat like shooting fish in a barrel, but it was a more bloody affair.

To the credit of the shooters, many of them let it be known that they regretted their decision to participate in such a travesty on sport. "I got more fun out of shooting turkeys in a pen," said one. "And I didn't like that either." Apparently believing that some remnants of sportsmanship would be retained in the affair, they had submitted their names—with $25.00—to the Arizona Game Commission, and had been selected by lot for the dubious privilege of taking part in the killing.

As for sportsmanship, one woman, obviously unnerved by her role as executioner, fired her rifle twice at a large bull from a range of perhaps thirty yards, missing entirely both times. On the third shot the game commissioner alongside also took aim and the two reports rang out simultaneously. The buffalo dropped with one ball expertly placed behind the ear. Even this loss of face was probably better than the brutal fiasco resulting when others continued to miss or wound the animals four and five times.

Among the press and curious bystanders present, there was no doubt as to the general reaction. "I've seen enough of this," said one press photographer, after seeing an exhibition like that recounted above. "They won't let us near the shooting anyway, so let's get out of here." And he departed with no pictures of

the sad event, not a common thing for his profession, regardless of the nature of the assignment or his personal feelings about it. However, he would have been refused pictures the rest of the day, as he had been during the morning, anyway. Other photographers who appeared to have cameras capable of adequately recording the event were rudely ejected from the shooting area, and not for safety reasons, by the Game Commission chief. One military police corporal, stationed there to safeguard military security, remarked in apologetic surprise at these tactics, "I guess they're just trying to avoid any 'slaughter' publicity."

Publicity or not, it remained a slaughter of the most inexcusable and inept type. Why was it necessary? Ironically, the reason given was that the buffalo were no longer serving any useful purpose at the Fort, since military regulations forbade the public access to the animals for photography and general study. Furthermore, the Game Commission stated, on the orders of General Emil Lenzner, commanding the Fort, they had been forced to move the herd some 49 times during the past five months, which worked a hardship on the animals themselves. How far they had to move them was not stated. Considering the huge, unfenced expanse of the Fort's ranges and the excellent condition of the animals killed, which before they were shot easily outran the cow ponies assigned to herding them, one might wonder if that "hardship" had not been imagined, or was not as severe as claimed.

A part of the slaughter of the bison were the unborn calves, the bodies of many littering the ditch below the skinning racks.

Further, and significantly, the execution of the buffalo herd followed a long series of arguments between the Game Commission and the Commanding General concerning game rights and supervision at the Fort. Earlier in the year, the General had ordered in violation of Arizona law, 103 deer hunting permits to Fort personnel to rid the housing area of deer, which were said to be attacking the householders there. Fifty-eight deer were thus illegally killed under this order. One way or another, the wildlife of the Fort, long a refuge for game animals, appeared to be doomed. The only question was that of authority, an issue becoming increasingly pertinent and hotly debated as the military services demand more land, usually in remote, unsettled areas, for purposes of experiment and practice. At the same time pressure mounts on game commissions of the States to provide more hunting area.

In this case a regular shoot of the buffalo had been scheduled, involving some 80 head of the yearly increase. After the argument between the two factions, the Commission decided, almost overnight, to extend the shoot to wipe out the herd, and thereby be rid of the matter entirely. Many protests at the evident spite in this decision were raised locally, both publicly and in more official manner. The Game Commission pointed out that these protests must have been made through ignorance, because there were two other smaller herds of buffalo still left in the State!

No real effort was made to re-settle the herd, but several offers were received to accept its suitable yearlings for protected residence elsewhere. Interest was expressed by the government of the State of Sonora, Mexico, in a score of the animals. The Arizona-Sonora Desert Museum, although lacking facilities at the moment, offered to take a pair of the calves. A foreign country, a penned enclosure! Are these the only places left for the American bison, perhaps more than any other animal the symbol of our West-that-was and the tragedy that befell its natural wildlife?

When we left that area of the Fort, the cowboys were racing to intercept another segment of the herd far below us on the grassed valley floor. The shooting, which had been removed to the relative seclusion of a distant grove, had commenced again. If one watched closely, it was possible to see the magnificent creatures fall, one by one, and be gathered up by the travelling hoist for transport to the skinning racks. If, on the other hand, one found it to be an exhibition of brutal indifference and ignorance too gross for tolerance, one could leave as it was requested—but not forget.

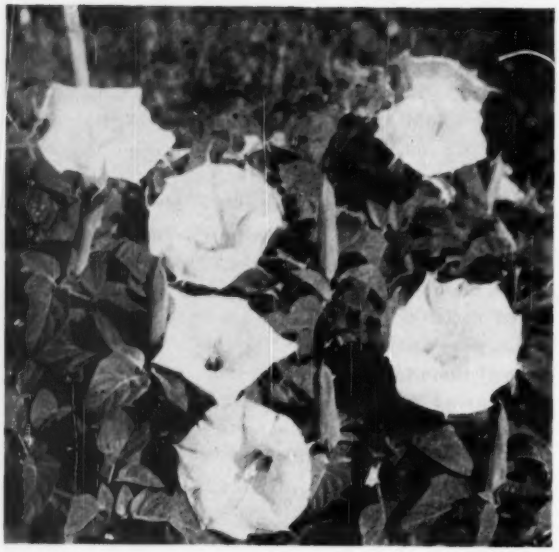
New Use for Datura

By NELL MURBARGER

IN THE great gallery of white-flowered plants common to roadsides and fields of the southwestern United States, none is more showy than the night-bloomer, *Datura meteloides*, more commonly known as sacred datura, thornapple, western jimson, and moon lily.

Students of American Indian lore have long known of many ways in which this widely-distributed plant was used by tribal medicine men. Only recently, however, have researchers at the University of Southern California found that the flannel-like foliage of *Datura* is laden with the drug, atropine, and thus offers the New World's first important source of antidote for the deadly "nerve gas," GB. Now being manufactured at the Rocky Mountain arsenal, in Denver, this substance is said to be so potent that one drop of it, in liquid form, coming in contact with a broken spot on the skin, can cause death in thirty seconds! As atropine, previously, had been available only from countries behind the Iron Curtain, discovery of this domestic source of supply is regarded as of utmost importance.

Each ton of leaves and stems from the desert plant are said to yield around two pounds of atropine, currently worth $320 a pound. In addition, the plants contain a commercially important quantity of scopolamine, a drug used in combating sea sickness and other forms of motion-induced illnesses.



Among early Indian tribesmen, a concoction brewed from the plant was used for various medicinal purposes and was the base of a powerful ritualistic cult known as "toloache." Believed to have originated among the Gabrielino Indians, of the California coastal area, the cult spread rapidly across the mountains and deserts to the Indian pueblos of Arizona and New Mexico, where it flourished for many years.

The Cry of the Quail

By JULIET BROOKE BALLARD

Hunters in the spruce growth, hunters in the grass,
Hunters where the seed pods thicken as we pass.
How can we escape them—who the summer through
Changed from downy nestlings to a hastening few?
How can we evade it, gun that will not fail?
How can we elude it, we the listening quail?

When the days were lengthening, and the sun was high,
We have seen the snake strike and a brother die.
When the nights were moonlit, we have heard the owl;
And the fox has stalked us on his nightly prowl.
How can we escape them, these the stalking men?
Will we hear the bobcat come for us again?

When the days were warming, and the nights were cold,
And our mother called us with a sudden scold,
We had much to master—sound and sight and scent.
He who did not learn these, very quickly went.
We have skill and cunning on the woodland trail.
Now the men are gunning for the listening quail.
May the God of Woodlands guide our faltering wings,
Strengthen and preserve us, we the least of things.

DRAWING BY AUGUST E. SELKMANN

The Marbled Salamander

By JERRY D. HARDY, JR.

Old Pop Hargrove rubbed his hands briskly, easing their numbness, as he hurried from the corn shed to his tiny warm cabin. An icy wind was knifing across the Carolina piedmont, and an ominous December cloud canopied the countryside with chill and gloom. Off in the meadow a giant hawk surveyed his world from the branch of an ancient, naked oak, hungrily hoping that some small thing might scurry forth into the evil evening. Presently, as daylight dissolved into darkness, giant droplets of winter rain began falling heavily. With the first trickle of wetness the hawk dropped from his bare branch and flew to an avian retreat deep within the forest. The farmer, hearing the symphony of wind and rain lashing against his home, turned out his light and retired early to his warm bed.

The meadow was a world of wind, rain, and cold earth. During the night, a tiny trickle of water raced down a gentle slope, gathering other small rivulets into a gurgling torrent of mud and coldness. The water spilled into the entrance of an abandoned burrow, built in the heat of summer by an energetic shrew. Far back in the burrow, beneath a patch of bare grass-roots, a mass of tiny spheres, each the size of a garden pea, covered the earthen floor. The onrushing water lapped nudgingly at the gelatinous balls, rolling some of them roughly against the wall of the smooth concavity in which they lay. Soon the flood covered them completely.

Then, strangely, the odd little spheres began pulsating in response to some inner force. They were the eggs of a fascinating and bizarre amphibian, the marbled salamander, *Ambystoma opacum*, and this was the midwinter natal night of a new generation.

The eggs gradually absorbed water until swollen to new dimensions. Meanwhile, as the added water exerted pressure on the walls of the eggs, a number of highly specialized unicellular glands in the head skin of the unhatched larvae began secreting a powerful enzyme. This literally ate away the gelatinous covering, finally allowing the tiny, fish-like creatures to swim freely into their new world of darkness, grass-roots, and cold water.

Exactly what happens to the young salamanders immediately after hatching is a point in their life history that is not well understood. Hatching may take place under a great variety of ecological situations. The eggs may be deposited beneath the debris of a dried pond bottom, under logs in flood plain areas, inside crayfish and rodent burrows, beneath mosses or leaf mold, or even, as one careful observer has noted, in the deep depressions made by the hoofs of cattle. Wherever hatched, the young larvae, born with gills adapting them to a strictly aquatic habitat, survive their terrestrial, natal beds and make their way to some body of rather permanent water. This may be either a subterranean pocket of seepage water, a large rain pool, or a small pond that has been swollen by the rains of autumn or winter. Here they feed greedily on tiny water fleas, worms, and other bits of water life until their bodies become stronger, and the lengthening days of spring give the pond a pleasant warmth.

By late April or early May the little creatures have grown from less than an inch to three inches in length. Then, suddenly, the magic of metamorphosis transforms them into gill-less salamanders able to return to the land from which their parents had come. Not yet, however, are they fully adult, and in this stage their pattern is radically different from that of their parents. It is so different, in fact, that for many years recently transformed individuals were not recognized for what they were, but were considered to be a distinct species.

Within six weeks following transformation, a mosaic pattern of white frosting on a black background finally evolves into the typical adult pattern of conspicuous, white, with dorsal blotches arranged on a background

of dark gray or black. The mature individual is thus a strikingly ornate creature, although it lacks the brilliancy and range of color of so many of its relatives.

The marbled salamander is found in a number of situations throughout its range, which includes most of the eastern and central regions of the United States. Quite frequently specimens are located, during the hot summer months, beneath logs or moss in low meadows. Such a meadow, near Burlington, North Carolina, is noted for its large numbers. A collecting trip to the area usually yields several plump, healthy adults.

The marbled salamander seems capable of withstanding drying out far better than many of its near relatives in the amphibian world. Specimens have been found beneath boards in the parched sand regions of coastal Virginia; others have been collected in dry rock crevices high in rugged Connecticut hills.

The adult salamanders, feeding at night, devour millipedes, pill bugs, earthworms, spiders, snails, caterpillars, moths, crickets, and a great variety of other small invertebrates. Occasionally an individual may wait at the entrance of a burrow, darting out occasionally to capture tiny bits of prey that chance too near its place of hiding.

During early spring and summer, when most amphibians are actively breeding in ponds, puddles, and streams, the marbled salamanders are concerned only with food and safety. Unlike their near relatives, they breed in autumn. Sometime between mid-September and early October, depending on situation, temperature, rainfall, and humidity, the males congregate in a suitable breeding area. This area may be near, but never in, a pond. They breed strictly on the ground. They are, in fact, exceedingly poor swimmers and die quickly in water from which escape is impossible.

The males, in the breeding area, seem richly ornate as though in formal attire. The jet black of their limbs and bodies is rich velvet, and their many blotches glisten with the whiteness of new fallen snow. The females come in less striking dress—their blotches and general color being toned with varying shades of gray.

When all of the salamanders from the nearby fields and forests are in congress their interesting activities begin. There are dueling matches between competing males; frustrated panic by those unable to recognize their mates; a bizarre love dance with the frenzied excitement and rhythm of a pagan ritual; finally the triumphant nuptial march in which the male leads his coy mistress off into the night.

For a time the entire group is quietly sociable, then some young male, responding to a deep instinct, begins dashing rapidly about butting his head against every individual he meets. As he runs bluntly into other males they take up the pattern of the breeding and begin cavorting. The females, meanwhile, bored with the whole affair, show no interest in these antics, and may move to avoid them. Proud and aloof, no female marbled salamander has ever initiated a love affair without first demanding pursuance by the frenzied male.

The nose-butting is to detect an odor that identifies males and females and aids in locating a mate. Occasionally two males may approach one another head on. This leads to a ridiculous dueling match, for each male tries desperately to force his head beneath that of his opponent. The result is a swift shaking of both heads from side to side, and up and down. This increases in fury until both heads are blurred to human vision. Carried on only by the males, this is probably the fastest movement of which the marbled salamanders are capable.

Finally the male locates his mate and begins butting her with powerful thrusts. If she attempts to escape he throws his body in a semi-circle before her, detaining her abruptly, and continues his love-making.

The detained female slowly becomes interested and indicates her interest by an embrace that develops into one of the strangest love-dances in the fascinating world of Nature, as the couple spin rapidly around in a tight circle. To some the dance suggests a waltz; to others it has the gaiety and intricate movements of an old-fashioned square dance; and to still others it brings to mind the heated rhythm of the tropics.

The dance may last from one to three minutes, and may be marked by several quiet intermissions in which the male approaches the female, gently rubs his cheek to hers, and wags his tail affectionately.

As the dance ends, the male straightens his body, flexes his strong hind legs to lift his body and, with tail wagging vigorously, deposits a spermatophore on the ground. This is a four-or five-sided mass of gelatinous material. Its top is slightly concave and holds the spermatozoa, the essential reproductive cells of the male.

The male, having contributed to assure a new generation, moves slowly away into the night. The female, still pursuing the male, follows him briefly until she stands just above the spermatophore. Being now more stimulated by the odor of the spermatophore than by her departing mate, she lingers over the gelatinous mass, thus fertilizing her eggs.

Several weeks later the female, following instincts known only to herself, seeks out a secret hiding place in her realm of earth, dead leaves, and moisture. There she deposits from fifty to 225 round, adhesive eggs. She may remain protectively coiled around her eggs for an indefinite period, this being determined largely by climatic conditions. With the coming of cold the mother abandons her un- (Continued on page 220)

Ingenue

By ELAINE V. EMANS

All is hushed, awaiting Spring's
Entrance. Does she, in the wings,
Sensing our anticipating,
Pause to tuck a straying curl
Of green in place, like any girl,
And smooth her petal-skirt, aware
She'll be *more* loved, if she dare
Keep us waiting?

Robert Ridgway

By W. L. McATEE

As to naturalists being born, not made, Robert Ridgway is a clear example. He was drawing birds at the incredibly early age of three years, and from then on through the prime of life he steadily developed in ability to portray and describe them. The love of plants, especially shrubs and trees, was an almost equal ardor, and one that never slackened.

From drawing birds he soon passed to painting them, and in a letter of October, 1920, he said: "The paints used . . . were made by me, that is . . . the crude pigments were ground . . . in gum water of my own manufacture, the ingredients all being obtained from my father's drug store."

When Ridgway began to collect birds with a muzzle-loading shotgun (made by his father from an old rifle), the required powder came from the same source, being made, he said, "from chlorate of potash, yellow prussiate of potash, and white sugar. There may have been something else. The formula was found in an old book."

Some of the pictures of birds were made for a schoolmate, Lucien M. Turner, himself later a noted naturalist. "He supplied the paper (plates torn from a Government report)," wrote Ridgway, "paid me 15 cents each . . . and I thought I was on the road to wealth!" Turner, a brother, and Robert were much interested in a brightly colored bird, which they called the "roseate grosbeak" but wondered about its accepted name. Turner's mother suggested that they write to the Commissioner of Patents in Washington, not so bad an idea as it may now seem, for the Patent Office was the incubator in which the early stages of both the National Museum and the Department of Agriculture were developed.

The letter and painting by Robert, then 14 years of age, were referred to Professor Spencer F. Baird, Assistant Secretary of the Smithsonian Institution, who named the bird as the purple finch, and extended encouragement, as he did to all students of natural history. Having found a source of reliable information, young Ridgway continued to send in bird portraits and to receive identifications.

The correspondence deepened in import, and in 1867, when Robert was in his seventeenth year, Professor Baird suggested that he might get employment on one of the Government exploring expeditions. After further exchange of letters, an offer was received from Clarence King, U. S. Geologist, of a position as Zoologist to the United States Exploration of the Fortieth Parallel. "How I survived this thrill," remarked Ridgway in maturity, "I do not know."

Robert Ridgway

Parental consent was obtained, preparations were made, and young Ridgway went to Washington for a short period of training under Baird. In May, 1867, he was one of a party that embarked at New York, proceeded to Panama, crossed the Isthmus, and went on in another steamer to San Francisco. The expedition was organized in camp near Sacramento. It consisted of about sixty men and was supported, from the time it entered Nevada Territory, by a company of U. S. Cavalry. Surveys were conducted in California, Nevada, and Utah, with stops here and there of from a week to three months. These gave Ridgway good opportunities for collecting; he was Zoologist, so collected animals in general, although specializing on birds. In the winter of 1868-9 he returned to Washington to study his collections and compile notes; he also visited his home before going to Utah for the field season of 1869. Preliminary papers on the birds of Utah and on those of the whole route were issued, but the formal report on ornithology of the Exploration was not published until 1877. It was in the form of nearly 70 quarto pages and is a work that ever since has been fundamental to any account of the birds of the region covered.

Meanwhile Ridgway had been employed by Baird in preparing descriptions and illustrations for a work then in collaboration with Thomas M. Brewer—a task the young man performed so well that he became joint

author of *A History of North American Birds*, three volumes of which on the land birds were published in 1874, and, after trying delays, two others on water birds, in 1884. With the first of these, Ridgway, at 24 years, became (and remains) the youngest author of any work of major importance on American birds.

Much in the field up to the time of his Smithsonian work, Ridgway did relatively little of this type of investigation thereafter. He collected in Florida during three winters, beginning in 1895, and in Costa Rica in 1904 and 1908. He was also on the Harriman Alaskan Expedition of 1899. What was most needed, however, was classification and description of the rich collections of the Smithsonian Institution, and this is exactly what he wished to do. So he settled down to that business and kept at it for more than fifty years—an unparalleled period of continuous, first-rate productivity.

This huge elm tree east of the Ridgway home is a favored spot for the famous white squirrels of Olney, Illinois.

Robert Ridgway's life-list of publications totaled more than 500 in number and 13,000 pages in extent. Among the more important ornithological treatises, other than the *History*, above mentioned, were: *A Catalogue of the Birds of North America* (1880); *A Manual of North American Birds* (1887; second edition 1896); *The Ornithology of Illinois* (2 vols., 1889, 1895); *The Humming Birds* (1892); *Birds of the Galapagos Archipelago* (1897); and *The Birds of North and Middle America* (1901-1919).

The last-named work, a summation of technical knowledge of birds of America north of (but including) Panama, is the culmination of Ridgway's career. The first volume (he called them "Parts") was published in 1901; it included 745 pages and 19 plates, and was followed by: Part II (854 pp., 22 pls.) 1902; Part III (821 pp., 19 pls.) 1904; Part IV (995 ppl, 34 pls.) 1907; Part V (882 pp., 33 pls.) 1911; Part VI (902 pp., 36 pls) 1914; Part VII (556 pp., 4 pls.) 1916; and Part VIII (868 pp., 34 pls.) 1919. These eight volumes contain full descriptions and synonymies of 651 genera and 2507 species and subspecies of native birds, besides those of 213 genera and 602 species of extralimital birds of irregular occurrence in the western hemisphere. The author had help, of course, especially that of Charles W. Richmond in bibliographical matters, and of Joseph A. Riley in various chores including taking measurements of bird skins. However, the conception, the classification, the endless drudgery of careful description, necessary to the completion of these eight large volumes are fundamentally Ridgway's. A fellow ornithologist, Witmer Stone, fully competent to appraise the series, pronounced it one of the greatest works on systematic ornithology ever written, and its author, at the height of his career, as the leading American ornithologist.

Ridgway lived about ten years after the appearance of Part VIII, and could have produced additional volumes except for increasing difficulties brought about by his removal to Olney, Illinois, in the old home region, in 1915. From the dates of publication, it would appear that he prepared only one volume while in residence at Olney. Probably he could have foreseen the danger of interruption to his great project, but anxiety as to his wife's health, their desire for country life, and just plain homesickness impelled him, and he must go. He had about 14 years there, nearly 13 of them with his wife at his side.

That he intended and hoped to complete *The Birds of North and Middle America* is shown by the following extract from a letter written in January, 1922: "I am hard at work on Bulletin 50, though under such adverse circumstances that it is impossible to make the progress that I would like. My plan is to finish up here the diagnoses of all the higher groups (down to genera), collect and arrange references for the synonymy, and all the work that does not require the handling of large numbers of specimens, before returning to Washington and taking up the description of species and subspecies." A brave hope, never to be realized; the work is now being continued by other hands.

At its annual meeting the preceding autumn, the American Ornithologists' Union had awarded him the Brewster Medal, its highest recognition of published work on birds of the Americas. In acknowledging this action, he wrote: "I really do not know how to ade-

The front, or north, part of the Ridgway home. Note the windows that extend to the floor. On the right is one of the larch trees for which the home was named. The rock garden is on the other side of the house.

quately express my thanks to the Union for the honor thus conferred upon me. It was so unexpected that its announcement came as a great surprise to me. It is hardly necessary for me to say that I take great pride in showing the medal to my friends."

While Mr. Ridgway was a Founder of the Union in 1883 and a vice-president from that year until 1891, he would not consent to election to the presidency except with the distinct understanding that he would never be called upon to preside at a meeting. He was a Corresponding Member of the Zoological Society of London, a Foreign Member of the British Ornithologists' Union, and member or honorary member of various other scientific societies. The Ridgway Ornithological Club of Chicago was named for him, and Bird Haven, [*Nature Magazine*, January, 1952.] a tract of land he had lived on for a time and had developed as an arboretum, has been maintained as a memorial to him. He is buried there, as he wished to be, on a hilltop where his wife's ashes were scattered. It is a lovely spot and over his remains a great boulder, bearing an artistic plaque, is closely embraced by spreading evergreen branches. The tablet, embellished by figures of birds, reads simply: Robert Ridgway, 1850-1929.

Although his only formal education was in the common schools, Ridgway was awarded an honorary Master of Science degree by Indiana University in 1884. He was Curator of the Division of Birds in the National Museum from 1880 until his death. According to a reckoning made in 1928, one genus, 23 species, and 9 subspecies of birds has been named for him.

Mr. Ridgway never lost the interest in color, manifested in his youthful bird painting, and, realizing the need of reference standards, prepared a book entitled, *A Nomenclature of Colors for Naturalists*, which was published in 1886. This was illustrated by 200 samples, and was welcomed and much used by naturalists of the period. He continued study of the nature, and of the reproduction, of color for the next 25 years, employing the most advanced scientific methods, and finally produced in 1913 his *Color Standards and Color Nomenclature*, with specimens of 1115 named colors. This immediately became the guide to color for descriptions in natural history, particularly in ornithology. Time has taken its toll, however, and some of the color chips in this work have deteriorated. Knowledge of color has progressed and there is need for a new review of the subject, but there is no question that Ridgway's work has performed a great and valuable service.

Another love—that of trees—also was lifelong; everywhere he lived for any length of time, Ridgway started an arboretum, and at Bird Haven, it is said, he had growing all but one of the kinds of oaks known in the eastern United States. He loved to ramble in the virgin forests of the lower Wabash River valley, admiring and measuring the great trees. He proved that more than 40 species of hardwoods there attained or exceeded a height of 100 feet. A tulip tree was tallest, scaling 190 feet, while a sycamore excelled in girth, with 37 feet.

To appraise Robert Ridgway: His life-long devotion to ornithology and his industry in cultivating the field are strikingly evident. He was retiring and even fearful of publicity and he had few squabbles in a period when controversy was rife. To those fortunate enough to become really acquainted with him, he was a delightful companion; and, despite his intense labors, he had the will and found the time, to help all who came to him. His feet were set straight on the road and his progress encouraged in every way by his mentor, Baird, but he did as much for others, and won a loyal and loving circle of friends, such as seldom blesses the lot of man.

Larchmound

By LELA CAMPBELL DOWELL

WHEN Robert Ridgway retired from Washington, D. C., in 1915, he moved to 1030 South Morgan Street, Olney, Illinois, where he created "Larchmound."

According to Robert Harris in his book *Robert Ridgway*: "There has been erected here by the loving

care of appreciative hands, an environment reflecting the characters and interests of the two whose home it had been for so many years; and it is a material expression of at least one reason for spending forty-five years of homesickness suffered by Mr. Ridgway in the cramped conditions made necessary by city life."

The old home at Larchmound was originally constructed by Sabin Baird, a contractor, in 1865, who sold it to Townsend H. Rowland before it was completed. After passing through the hands of three generations of Rowlands—grandfather to grandson—it was finally purchased in 1911 by Ridgway from Elbert M. Rowland. The original plot consisted of 8.68 acres, and was then known as "Persimmon Hill" because of its numerous persimmon trees.

There were several factors that influenced Ridgway to choose Olney for his permanent home instead of Mt. Carmel, Illinois, where he was born and reared. When he left Mt. Carmel in 1867 to go to Washington, it was his full intention to return there, and all of his plans were made accordingly. But forty-four changeful years were to elapse before he returned to southern Illinois. Could he have foreseen this expanse of time, it would have been comparable to a "life-sentence in prison, which only the interest in my work under favorable auspices enabled me to endure," he said.

When the time finally came for Ridgway's retirement, Mt. Carmel was changed. Not a single relative remained. Nearly all of his boyhood friends had either passed away or moved to other places. His old familiar haunts where he had studied Nature, especially birds and plants, had been almost completely obliterated, either by clearing, drainage or cultivation. During his boyhood days Olney was as much his home as Mt. Carmel as he had many relatives there, including fourteen first cousins, nine of whom were boys. There he visited often and in 1865 spent the entire summer. There, too, his parents were buried.

Areas around Olney gave Ridgway abundant opportunities to study wildlife. On one of his many visits, he had one of the greatest ornithological thrills of his life. Fox Prairie, for instance, was teeming with wild turkeys and passenger pigeons. There, in 1871, he saw hundreds of swallow-tailed kites and dozens of Mississippi kites performing their graceful aerial evolutions.

Perhaps one of the greatest factors that determined the naturalist's choice of location was that, he was always interested in botany, especially the study of trees and shrubs and their geographical distribution.

Larchmound, which Ridgway named for two great larch trees growing on a gentle slope in front of the house, at once became a propagating place. Plants and cuttings were grown there, from whence they were transferred to Bird Haven, his sanctuary-arboretum two miles north of Olney. At Larchmound, the varieties of the different plants, shrubs and trees became so numerous it was necessary for him to catalog them.

Today Larchmound is privately owned. Its owners, Mr. and Mrs. Harvey Hays, purchased it from Mrs. O. C. Palmatier, Ridgway's sister who was living with him at the time of his death. The Hays found the grounds proved too much for them to care for. Portions on which vegetation had been allowed to grow unhampered for wildlife cover have been sold for building sites. Two new homes have been built on the south and four are scheduled to be built across the north or front. The original acreage has been reduced to a plot 312 feet long by 360 feet deep, or two and one-half acres.

The house is in excellent condition. The owners have renovated, repaired and painted, but have exercised great care in retaining original lines and preserving any features that might be of interest to posterity. Windows extend to the floor, ornamental plastering in relief adorns the center of the ceilings and heavy moldings join ceilings to walls. The original plain poplar woodwork is intact. Many of the naturalist's personal effects, as well as his work-table, have been preserved.

Ornamental trees and shrubs at Larchmound show the result of careful planning in succession of blooms and fruit. Flower beds made by his own hands still have their original contours.

Perhaps spring is the most inspiring, soul-satisfying season at Larchmound, if there could be a choice. Magnolias, redbuds and dogwoods herald its coming, followed by Japanese cherries, ornamental fruits and other exotic and semi-tropical trees and shrubs. Century-old elms tower above all. In partial shade, spring flowers make carpets of blue and white. Hardy ferns, lily-of-the-valley and coral bells grow lustily in the rock gardens and tiny wild violets frame the door-steps.

During the hottest summer, mimosas bloom for weeks; and as colorful autumn approaches the lemon tree becomes golden with ripening fruit and the turkey berry, not unlike a thornless holly with its scarlet berries, is a blaze of color. Conifers are adequately distributed and enhance the beauty in winter.

At different times, the famous home has been thrown open for formal receptions, which required specific decorations in different rooms. An ever-ample supply of bright-colored seed pods, ornamental fruits, multicolored leaves and flowering shrubs on the Larchmound grounds furnished an effective decor for the most elaborate occasion.

A huge elm east of the house is a noteworthy feature of the informal landscaping. It must have deeply impressed Ridgway for he took many snapshots of it. Bird feeders of various types were placed on and about the tree. Here from his bay window, with his magazines and books around him, he watched and studied his feathered friends. Today it is the favored spot of Olney's famous white squirrels which Mr. Hays encourages by regular feeding.

Certainly Larchmound remains in keeping with the life of the man who created it. Because of Ridgway's national and international renown, and his long connection with the Smithsonian Institution in Washington, D. C., the grand old home has been recently acclaimed as having national importance.

Herodotus Called Them Petrified Lentils

By RICHARD L. THREET

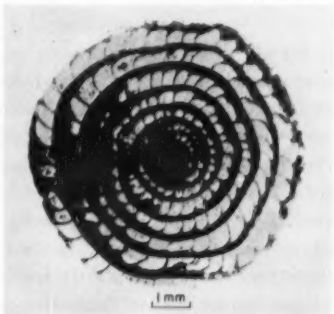
Photographs by the Author

Nummulites and lentils, photographed together, to show the remarkable similarity in appearance. There are only six nummulites shown in the photograph; can you find them? Refer to the key on page 218 to check your results; the nummulites are there indicated by "x".

More than four hundred years before the birth of Christ, the Greek historian and philosopher, Herodotus (484-425 B.C.), visited Egypt in the course of his extensive travels in the Mediterranean region. At the great pyramids of Gizeh, near Cairo, he noted huge blocks of limestone composed almost entirely of tiny lens-like fossils. He concluded that they were petrified lentils, once stored there as food for the slave laborers who built the ancient pyramids. Because these fossils had the form of a bi-convex lens, sometimes flattened by rock pressures, they later became known as *nummulites* (Latin, *nummus*, coin; Greek, *lithos*, stone). But the lentil interpretation by Herodotus went unchallenged for centuries.

It was not until the middle of the 16th century that Conrad Gesner described the first nummulites known in Europe, found in the vicinity of Paris, and suggested their relationship to the modern pearly nautilus, although many of his contemporaries regarded the nummulites as mere freaks of Nature, or "caraway stones." It remained for the development of micropaleontological techniques, which involve microscopic examination of transparent, thin slices of small fossils in order to study internal structures for biological classification purposes, to provide the basis for modern knowledge of the nummulites. Such knowledge came in the early part of the 19th century. We know now that these "stones" were an important family of shell-secreting Protozoans of various sizes, closely related to the modern Foraminifera whose multi-chambered shells are accumulating in layers of limy ooze on ocean bottoms.

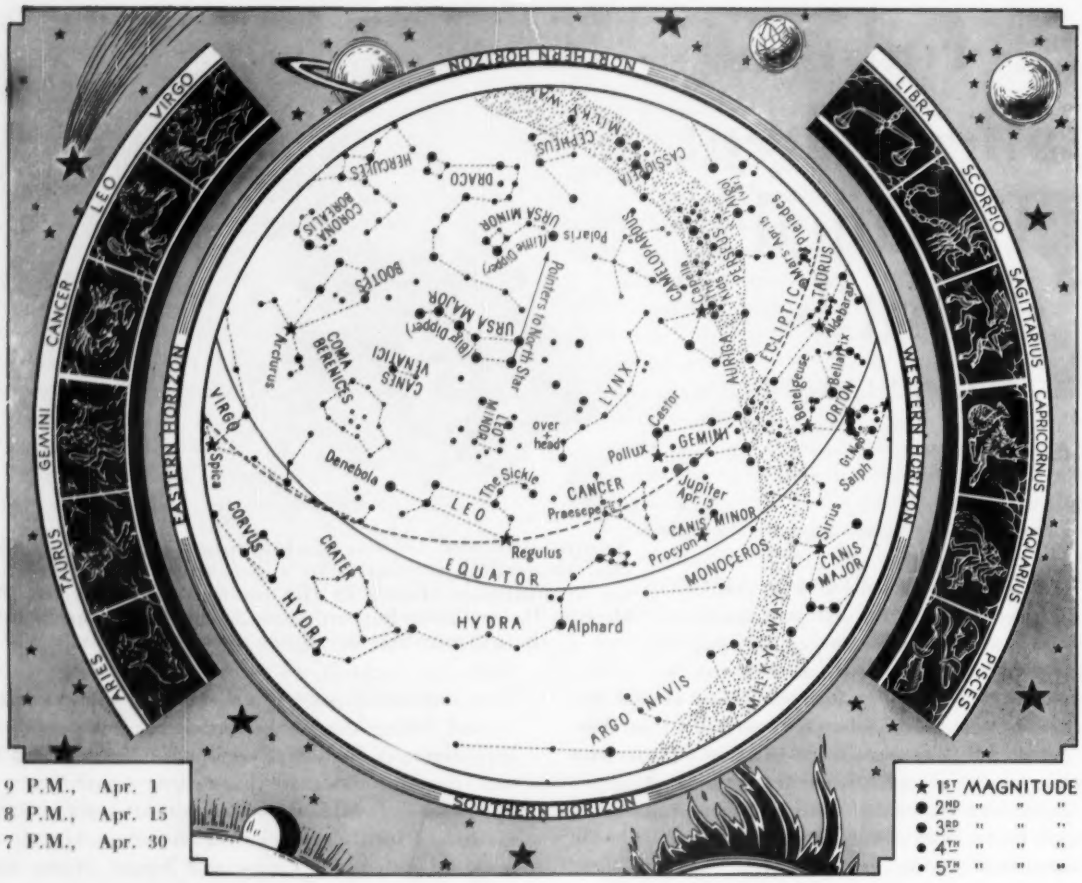
The nummulitic limestone was quarried for building the Egyptian pyramids. Also, the famous Sphinx was carved from ledges of this same rock.



Enlarged photograph of a transparent, thin slice (equatorial section) of a fossil nummulite, showing the spiral arrangement of chambers within the shell.

This limestone is part of an extensive marine deposit formed during the Eocene epoch of geologic history, approximately 50 million years ago. Remnants of this vast mass of limestone have been found from the Pyrenees and Atlas Mountains to the Carpathians, southward into Egypt, Persia, and Asia Minor, and eastward into India, China, and Japan. These widespread occurrences testify to the former existence of an east-west seaway that stretched from the Atlantic to the Pacific, flooding among embryonic mountains of the growing Alpine and Himalayan chains, until most of southern Eurasia and northern Africa were inundated. Nummulites and other sea life flourished, and as the animals died, their shells rained down on the ocean bottom, later hardening into layers of limestone.

Although the coasts of North America were being flooded at the same time, the environment was somewhat different, and we do not find the great deposits of nummulitic limestone in our geologic record. We do, however, find deposits of sand, clay, and marl that contain abundant fossils, or orbitoids, of a near relative of the "coin-stones." In the Gulf Coast region of the United States, petroleum geologists recover millions of the tiny orbitoids, and related microfossils, from cores and chips of rock brought up from depths of thousands of feet during the drilling of oil wells. Careful study of the various fossil forms permits precise correlation of the subsurface geological formations, in order to reconstruct ancient geography and predict the location of new oil pools.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Milky Way

By SIMONE DARO GOSSNER

RETURN of the warm months heralds for the astronomer the opportunity to see once again the splendors of the summer Milky Way. Yet it is sad to observe that many people have never even seen it. The red glow of neon lights that hovers over our cities all but obliterates the fainter stars otherwise visible to the naked eye. In addition to being the bane of the astronomers, city lights deprive many people of one of the most truly grandiose spectacles that the skies have to offer. The readers of this magazine are interested in outdoor life—they have the advantage over many urban-bound people and have found themselves occasionally in open country on a dark summer night. Such outdoor folks are, no doubt, familiar with the faint, luminous band we call the Milky Way. On the monthly sky maps that accompany these articles, it is shown as a gray shaded area, and it is marked.

The best conditions under which to view the Milky Way are found throughout the summer, provided the moon is out of the way. Viewing is particularly favorable in the latter part of August, at which time one of the most beautiful sections is almost overhead in the early evening at our latitudes. Shortly after sunset, and after the eyes have become accustomed to darkness, a faintly luminous band can be traced from Cassiopeia in the northeast, through Cepheus, to Cygnus overhead; and from Cygnus to Aquila and Sagittarius on the southern horizon. As the night progresses, Cassiopeia rises slowly in the sky, and the Milky Way may be traced successively through Perseus, Auriga and Taurus, as they come into view. As Taurus rises, the approaching dawn interrupts the show, but, in early fall, other

sections will be seen in Gemini, Orion, Monoceros and Canis Major. None, however, is quite as beautiful as Cygnus or Sagittarius.

Actually, the entire Milky Way forms a continuous belt, a great circle, on the celestial sphere. Other sections thereof are visible from the southern hemisphere. The modern interpretation of this appearance exemplifies remarkably how various data of observation, gathered at first without unity of purpose, can be coordinated gradually into a logical concept of the universe that surrounds us.

In the nineteenth century, the Herschels had already observed that the density of the stars, especially the fainter ones, increases considerably as one approaches the Milky Way. A small telescope is sufficient to add to this knowledge the fact that the diffuse luminosity of the Milky Way is caused by the combined appearance of myriad faint stars. Although individual stars vary in absolute brightness, it may be considered that, on the average, the fainter stars are also the more distant ones, in the same manner that a row of street lights appear to decrease in intensity as one looks farther down the street. Since the most distant stars are all seen in the Milky Way, it is justified to assume that they all belong to a huge, disc-shaped system, in which the sun itself is located. Because this system has a certain thickness, it is understandable that we see the nearby stars all around us, whereas we must look along the plane of the system in order to see the stars that are farther away.

Although this interpretation appears logical enough, astronomers like to confirm their theories by additional data, and other observational evidence has been accumulated to support the view that the Milky Way is a flattened disc.

By using long photographic exposures on the larger telescopes, it has been possible to photograph some very distant objects in considerable detail. Some of these turned out to be great conglomerations of stars, which exhibit precisely the same disc-like feature that we attribute to the Milky Way. The Greek word for Milky Way is *galaxy*, and this name has been adopted to designate such stellar systems. When they were first observed, the telescopes were not powerful enough to indicate that they were composed of stars. They looked like clouds, or nebulosities, on the photographic plate, and were originally called *nebulae*. The name is still in widespread use, although it is a misnomer when it designates a galaxy.

A remarkable example of such a galaxy is the Great Spiral Nebula in Andromeda. Incidentally, all attempts to change its name to the Andromeda Galaxy have so far met with failure. It is visible to the naked eye as a faint luminous patch to the northwest of Beta Andromedae, about halfway between Perseus and the square of Pegasus. As galaxies go, it is our close neighbor, and can be studied extensively with the larger telescopes. By furnishing a means of comparison, it has served as a guide to astronomers in understanding the structure of our own Milky Way.

Light from a Star

By DANIEL SMYTHE

Eons, galaxies away
From our unruly day,
The star flames—and we look
At this point of the book
Of sky. We touch hands still,
And hear the throbbing hill
Of earth sound as if there were
Some reason for its stir.
We think there is; our hands
Move on these star-strewn lands;
And love shines down on us,
Certain, mysterious.

In the light of recent studies, it has become quite certain that the Milky Way is also a spiral galaxy. In other words, the disc is not homogenous, but consists of a highly concentrated nucleus of stars, surrounded by several spiral arms swirling around the nucleus. Along the spiral arms are to be found great clouds of gas, intrinsically very bright stars, novae, and dust. The overall diameter of the system is estimated at 100,000 light years. This means that a ray of light would take 100,000 years to travel the length of this diameter. For the sake of comparison, one should note that a ray of light travels from the sun to the earth in eight minutes. The position that our sun occupies is not remarkable at all. It is located approximately at 35,000 light years from the center, or about two-thirds of the way to the edge. Quite an ordinary star, it is average in size and brightness, and has no feature that would make it stand out for a distant observer.

As seen from the solar system, the center of the Milky Way lies in the direction of Sagittarius. Astronomers have not yet been able to observe the nucleus itself, but in that direction is to be found the greatest concentration of remote galactic objects that can be seen anywhere in the sky. The sun is revolving around this center with a speed of 150 miles per second. Assuming that the present estimates of galactic dimensions are correct, this means that the sun would make one complete revolution around the nucleus in two hundred million years.

In the last twenty-five years, a great deal of speculation has been devoted to the question of the age of the Milky Way. Until a few years ago, it was generally agreed that this age was not in excess of three billion years. This concept was based primarily on two premises: First, that stars are no longer being formed, and, second, that the matter inside the stars is gradually used up by radiation and that no star could have lasted longer than three billion years. A drastic revision of these views was brought about by the recent work of F. L. Whipple, at Harvard, L. Spitzer, Jr., at Princeton, and others, who have shown convincingly that stars could be formed right now out of intergalactic material. At the same time our (Continued on page 220)

The School Page

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

SUPPLEMENTARY READING

THIS page has consistently preached the philosophy that the greatest rewards in the natural history field come from direct experiences with Nature. In spite of the discussion on this page this month, we do not withdraw in the least from the defense of that philosophy. Rather, we hope to strengthen it by suggesting some supplementary reading, which, we believe, may stimulate the sort of Nature activity we urge on the part of teachers, who may, in turn, stimulate it in their students.

We will not attempt to suggest references to books that help in identification of plants or animals, or of the inorganic phases of Nature. Rather, we want to suggest a few books written by persons who evidently like to learn what is going on in the field of Nature. We are exercising further restraint and not considering material such as comes so splendidly from the pen and camera of Edwin Way Teale. His efforts are often so satisfying that one is inclined to let him do all the experimenting for us.

We do want to call your attention here to a few recent—and not so recent—books that present natural history stories so well that you will want to go out and enjoy similar experiences. In a way, we are suggesting further books written along the lines of Ruth Crosby Noble's *The Nature of the Beast*, to which we have referred recently. Appropriately, she gives her book the subtitle of "The Fascinating Story of Animal Behavior."

To me possibly the most stimulating of the books on my list here was published in 1909 by Macmillan. It is out of print, but you may find it in your library, and if you have not seen it you are in for a tremendously interesting experience when you read *Concealing Coloration in the Animal Kingdom*. This is a summary of Abbott Thayer's discoveries relative to the laws of disguise through color and pattern, and was prepared by Gerald Thayer. The story presented in this book found much practical application in the field of camouflage, which has played such an important role in warfare. Read it again if you have the chance, and look for examples of the ideas presented in your own backyard.

More recently we have found Alfred Knopf publishing a translation of Francois Bourliére's *The Natural History of Mammals*, which I have read from cover to cover at least twice since it came to my library this last year. If you have not read it, you have a real treat in store. In a way, it builds on the story presented by William Hamilton, Jr.'s *American Mammals*, published by McGraw-Hill in 1939. That will always be good reading for any naturalist. While these books deal almost solely with the facts of mammal natural history, Clifford B. Moore gave us, through the Ronald Press Company, in 1953, an interesting book, *Ways of Mammals in Fact and Fancy*. This book integrates what we know about mammal natural history with what many have come to believe through hearsay and other undependable means. It should be useful in helping us recognize the pitfalls set by careless observation and conclusion. The book should be read by teachers generally.

Of course, we could refer you to many of the books on ecology that have been printed in recent years, but we will leave that for another time. There is a rich literature dealing with the behavior of animals of the sea and of the sea shore, which we cannot present here, but we do wish to call to your attention the *Natural History of Marine Animals*, by G. E. and Nettie MacGinitie, and published in 1949 by McGraw-Hill. It would seem that this book combines happily much that the taxonomist, the morphologist, and the ecologist would have to offer.

The interest of a goodly proportion of our naturalists centers around insects. Insects are to be found ready for observation and experimentation at almost any time and place. We must understand them to survive, and so any time spent in training others as to how to get along with these creatures cannot be considered as wasted. Somehow, despite the host of books published on this subject, I still find most stimulating of all Major R. W. G. Hingston's *Instinct and Intelligence*, published in 1929 by Macmillan. Here we find, attractively presented, the experiences of a man who obviously liked to set the stages for changing the behavior of insects. The book should be in all school libraries, and while its presentation lacks the literary skill shown by Fabre in his many books, nevertheless it has its own contribution to make to the behavior of naturalists. Read it. More recently Marston Bates gave us, through Macmillan, his *The Natural History of Mosquitoes*, which appeared in 1949. It is difficult to understand how any naturalist can fail to be intrigued by this book, even though at times it gets a bit too involved for the layman to follow.

Bird students who are not satisfied with just getting big bird lists, but who wish to understand the behavior of birds, and possibly to modify it, are recommended to read Edward A. Armstrong's *Bird Display and Behavior*, published in its most recent edition, in 1947, by Lindsay Drummond of London. Bird photographers who are most successful shamelessly play upon bird psychology to make their subjects come to a blind, make an effective display, or otherwise do what is wanted. It is a relatively common zoo practice to show a stuffed female bird to a captive male to induce him to show his courtship antics and display. Similarly, photographers find that stuffed birds near a blind may stimulate an activity that assures a superior picture.

Possibly the most intense study of a small group of birds, from the angle of their courtship behavior, is reported in L. E. Richdale's *Sexual Behavior in Penguins*, published by the University of Kansas Press in 1951. The book is not always easy reading, but it shows well what one man, dedicated over a long period of time to getting the last word on the behavior of one group of creatures, can do. Of a more general nature, but dealing chiefly with a similar subject, are three books published in the past few years. One is *The Mating Instinct*, by Lorus J. and Margery J. Milne, published in 1954 by Little, Brown and Company and dealing with the sexual behavior in the animal kingdom and its significance to man. *The Sex Life of Wild Animals, a North American Study*, by Eugene Burns, published in 1953 by Rinehart and Company, and *Animal Courtship*, by Maurice Burton, published in 1953 by Frederick Praeger, are the other two.

Another phase of animal behavior is considered in the most recent addition to my library. I rather suspect that this new book will find more frequent use by me, and by many others, than any other book that I have purchased in recent years. I refer to Olaus Murie's *A Field Guide to Animal Tracks*, a unit of the Peterson Field Guide Series published in 1954 by Houghton Mifflin and Company.

Seton's *Lives of Game Animals*; Rossell's *Tracks and Trails*; Mason's *Animal Tracks*; Jaeger's *Tracks and Trailcraft*, and Brazier Howell's *Speed in Animals* have given us a good background for appreciating the task undertaken by Murie in writing his new book. Reference is made to all of these books in Murie's bibliography, except to Howell's work. While he refers to separate articles by Howell, it is unfortunate that Murie did not use some of Howell's devices for recording and interpreting gaits. Similarly, while Murie quotes two of the less important papers I have written on animal tracks, I wish he might have read and used, or at least evaluated, more ambitious efforts that found expression in "He That Runs May Be Read," which appeared as a special insert in *Nature Magazine*, and the track formulae and other material I gave on tracks in *The Fieldbook of Natural History*.

I know of no book so rich as Murie's in dealing with scats, or with significant plant injuries caused by animals. I wish he had enlarged on the chapter on birds and the chapter on invertebrates, but this only means that eventually we may get another book from this master naturalist, artist, writer and man. Few persons can read this book of his and not get interested in studying animal behavior.

Indiana Camp

The Tenth Annual Indiana Conservation Education Camp for teachers will be held at Versailles State Park, Versailles, Indiana, from June 13 to July 23, 1955. Two consecutive field courses of three weeks each are offered. The Camp is administered by Purdue University and sponsored jointly by the Indiana Department of Conservation, the State Office of Public Instruction and Purdue. Further information may be obtained by writing to Howard H. Michaud, Department of Forestry, Purdue University, Lafayette, Indiana.

Harvard School

Three courses for secondary-school science teachers are offered from July 5 to August 17 this year by the Harvard Summer School and Graduate School of Education. There will also be a course on "Science in the Elementary School" for teachers and supervisors on the elementary level. A number of special fellowships are available for these courses. Full information both about the courses and the fellowships may be obtained from Harvard Summer School, 2-N Weld Hall, Cambridge 38, Massachusetts.

National Camp

From June 13, when a special June Institute will be held, to September 12, when the last of eight programs will conclude, National Camp again will offer outstanding camp leadership courses. This is living and learning in the outdoors, and the Pocono Mountains are the locale. Full details of the varied and important program may be obtained by writing to Dr. L. B. Sharp, Outdoor Education Association, 369 Lexington Avenue, New York, 17, N. Y.

Scout Good Turn

There is much reassurance for the future of our natural resources in the report of the National Conservation Good Turn program of the Boy Scouts of America in 1954. It summarizes actual accomplishment. For example, Scout projects in soil and water conservation piled up a record of 781,955 feet of stream and lake shore improved to prevent erosion and make water more suitable of industrial use, recreation, fish and wildlife. A total of 1,093,142 feet of hedgerows were planted to protect topsoil from wind erosion and to provide food and cover for wildlife. Eroding gullies to the number of 65,485 were worked on to prevent further loss of soil and to help rebuild the land for agricultural use. On 20,363 acres of land grass was planted to provide protection for valuable top soil, to prevent too rapid water run-off and to develop pasture land for livestock. Comparable achievements are recorded in the fields of forestry, wildlife and outdoor manners. This report is inspiring reading.

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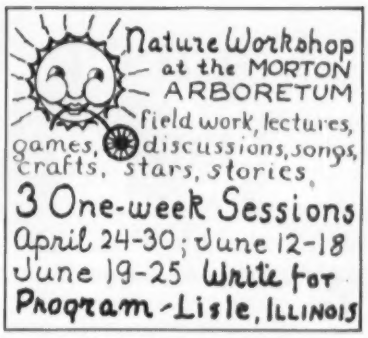

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Camera Trails

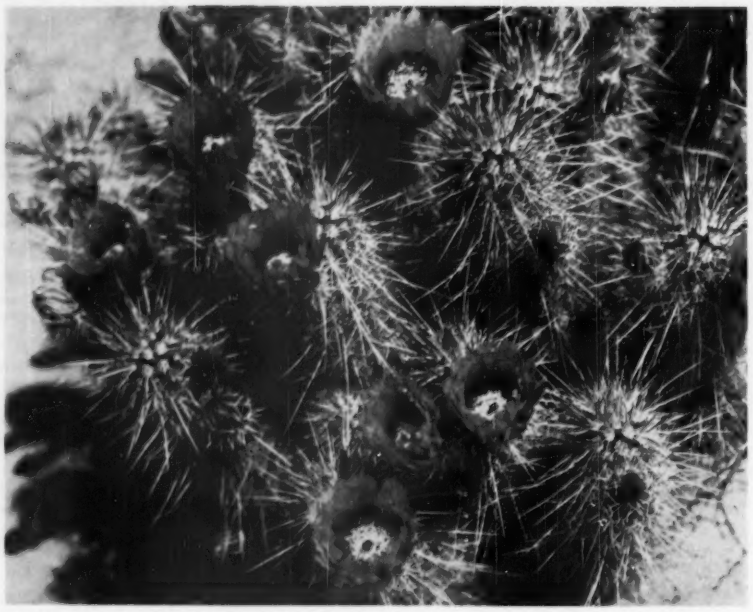
By

EDNA HOFFMAN EVANS

WE HAD an unusually heavy rainfall back in January—more than three inches, which really is a lot of rain for Arizona—and consequently the desert this spring is truly blooming like the rose. It is amazing where all the plants and flowers come from. They have been hiding somewhere through months and even years of sunbaked dryness. Last spring, for example, there was so little rain that a botany teacher of my acquaintance was hard put to find any wild flowers for his classes to study. This year he has had no difficulty at all in finding specimens.

Before I became acquainted with the desert country of the Southwest I thought that a desert was just an unbroken stretch of sand, like a seashore without any sea. I never realized what a great variety of plant and animal life was to be found on the desert. And as for desert flowers, I never thought such things could exist.

The desert in bloom must be seen in order to be believed, and, once seen, it is a sight that will never be forgotten. This year places that are usually stony wastes or hard-baked expanses of dry earth are carpeted, nay, blanketed, with flowers. The symphony of bloom has been in progress for more than a month now, and may last another month before the hot summer sun bakes everything to barrenness again.



With black-and-white film the photographer can capture only a few of the beauties of the cactus blossoms. This is a hedgehog cactus cluster.

The colors are not as violent or as dramatic as those of the tropics—the West in spring is still a land of pastel colors. Brightest, probably, are the palo verde trees that are great masses of yellow blossoms. The ironwoods are smoke-purple, and the mesquites are a fragrant but inconspicuous greenish-yellow.

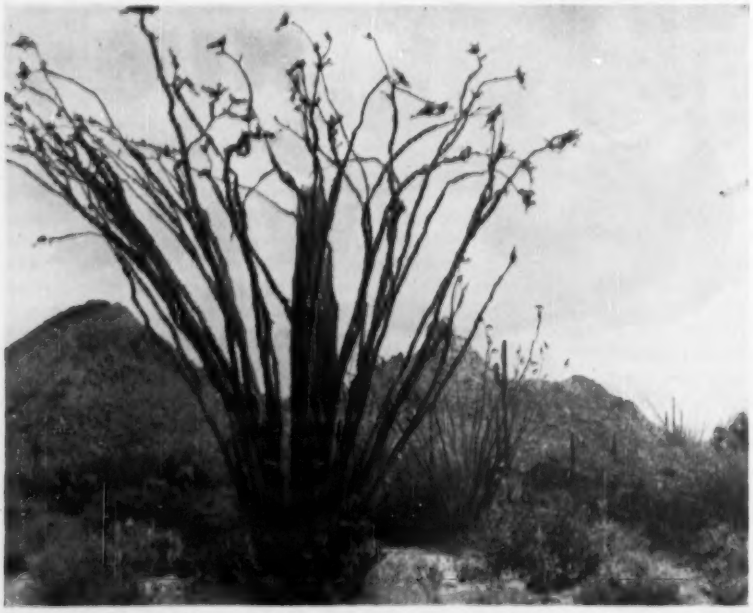
As for the wild flowers, there are acres of orange hue, colored by vast numbers of sore-eye poppy. Penstemon, lupine, and sand verbena add brighter shades of rose and purple, while the spectacle pod, prickly poppy, and evening primrose contribute white flowers to the landscape. In other areas California poppies are growing in seas of golden yellow.

But it is not the wild flowers that arouse the greatest admiration in me. Instead, it is the beauty of the cactus blossoms that tends to leave me speechless, and which causes me to reach for my camera. How those prickly, unapproachable-looking plants manage to produce such beautiful and dainty blossoms is nothing short of a desert miracle.

Normally, a person tends to think of a cactus as a plant that is content to grow in arid, waterless regions. But cactuses, too, respond to additional moisture. From the giant saguaro to the golf-ball-sized pincushion cactus, they take on new personalities when there is sufficient water to motivate them. The saguaros and the shorter, stockier barrel varieties drink in the moisture until their trunks are so swelled and tight that almost all the vertical wrinkles are stretched out of them. The pincushions perk up, take on a greener look, and their spines are more alive and pricklier than ever. Then, with plenty of nourishment stored away, the cactus clan is ready to present its spring display of flowers.

High up in the air—ten, twenty, or even fifty feet above the ground—the saguaros unfold their white, trumpet-shaped flowers, revealing to the moon and the stars the golden treasure inside. They are mostly nocturnal, although the blossoms can be seen in the morning or at dusk when they are just opening. Like most cactus blossoms, the flowers last but a single day or night. The barrel cactus varieties usually have yellow flowers, borne one or more at a time on the top of the spiny column.

Down closer to the ground, where the



Taller plants like the ocotillo are best photographed against a background of sky and rugged horizon.

pincushion and fishhook cactuses grow like furry (but, oh, so prickly) green knobs, there are more blossoms, pink or yellow. Just a little taller, and even more prickly than their pincushion cousins, are the hedgehog cactus clusters. The hedgehogs are about a foot tall and their spines are two inches long and sharp as needles. But in the spring one can forget those needles (unless one comes in direct contact with them) because the hedgehogs are prolific bloomers. Their cup-shaped flowers range in color from pale lavender to scarlet, crimson, and royal purple. Usually they are the first of the cactus tribe to burst into bloom in the springtime.

Perhaps some of my Eastern readers, who are not very familiar with cactus plants (if one can ever get very familiar with a cactus) may think I am overstressing the prickliness and general all-around spinyness of the various members of the cactus family. Please do not think I exaggerate; almost every plant on the desert has spines, or thorns, or sharp, scratchy defense mechanisms of some kind. There is a saying in Arizona that so far as wildlife on the desert is concerned: "If you touch it, it scratches; if you pet it, it bites; and if you eat it, it kills you." That is not necessarily so, of course, but the spines and thorns are ever-present.

In the opuntia family, the prickly pear varieties have yellow flowers; some of the longer stemmed kinds have maroon colored flowers, while the extremely prickly chollas (the so-called "jumping cactus" plants) have pale greenish ones that are not at all showy. Not that the jumping cactus needs flowers in order to attract attention. It is so spiny, and the joints between its sections are so easily broken, that the plant actually does seem to jump at the unwary passer. Just as the porcupine does not "throw its quills," the jumping cactus does not "jump." But in both cases, the slightest touch will cause the spines to leave their original home and stick fast (but far from lovingly) to whoever gets within sticking distance.

Last to be mentioned here, but certainly far from least in both beauty and novelty of blossom, is the ocotillo. This plant looks like a thorny collection of fishing poles during the dry seasons. But when the needed moisture is present, the brown stems bear a thick coat of short green leaves, while at the end of each stem is a cone-shaped cluster of bright red flowers. Actually, the blooming ocotillo looks as though each of its stems is tipped with a jet of flame.

How does one photograph the desert in bloom? The problems are much the same as with any kind of flower. Only color film will do justice to the scenes and give them all their natural beauty. With black-and-white film, the photographer can capture only a few of the beauties—the delicacy of light and shadow, the play

The Ansco Super Regent camera features a new automatic compensating shutter.

of sunlight on a many-spined surface in contrast to the smooth sheen of the petals, and the delicate tracery of pistils and stamens.

With the low-growing varieties, the problem is to get down to them, and with the tall specimens, the problem is just the opposite. To photograph the saguaro

The new Kodak Retina IIIc camera with the 80mm longar xenon C lens component on the camera and the special 80mm viewfinder above.

blossoms one often needs a step ladder.

Correct exposure is important. With a bright sun and cloudless sky, it is hard to keep from over exposing some portion of the picture. Either the foreground is too dark, or else the background is indistinct and out of focus. With color, a bit of sky is usually desirable, but to get an angle that includes both low-growing plant and sky is not always easy. Distracting articles like twigs, grass blades, or stones should be removed from the surroundings whenever possible. Likewise, dried or withered blossoms should be removed.

Exposure times should be consistent both with light and with wind conditions. Even though the cactus plant is itself sturdy enough to stay motionless in a brisk breeze, the more delicate flowers will move in the wind. Thus, unless you are lucky enough to be out on a windless day, you should shoot fast enough to stop motion. But in doing so, try to sacrifice as little of the detail as possible.

It is difficult to decide just what angle to use in taking cactus pictures. Too much from the side and all you see is the profile of the petals nearest you. Too much from above and your picture be-

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comes flat and loses perspective. An angle that gives height to the stem, and yet shows some inner parts of the flower, is the one most to be desired.

Taller plants like the saguaro, ocotillo, and the barrel cactus are better photographed against a background of sky and with a horizon that is not flat, but instead is broken by hills or the steep slope of some mesa or mountain. With such pictures you can often catch the true spirit of the desert—vast, mysterious, somewhat forbidding, and yet full of color, and beauty, and magic.

NEW CAMERAS

Both Eastman and Ansco have announced new cameras, or rather new and improved models of cameras already on the market. The Eastman offering is the Kodak Retina IIIc, while the Ansco addition is the Super Regent with a new compur LVS shutter.

The Eastman Retina IIIc is reported to be highly suited to sportsmen and outdoor camera enthusiasts who have specialized needs in their picture-taking fields. The new model features a fast-working thumb lever for winding the film, setting the shutter, and advancing the exposure counter, all of which make possible rapid action sequence photography while the camera remains at the eye in normal viewing position. The camera also has a new system of changeable lens components, which permits the user quickly to adapt the standard lens to either telephoto or wide-angle work, plus a new built-in exposure meter. There are ten shutter speeds, from one second to 1/500 second, plus built-in flash synchronization, and a built-in self timer. With a Retina-Xenon C f/2 lens, 50mm, the camera is priced at $185.

Ansco's Super Regent is said to be the first miniature camera in the United States to feature the new automatic exposure compensating shutter. The new LVS shutter (LVS stands for Light Value Scale) offers the photographer a new system of numerical light values and new interlocking shutter speed and diaphragm controls. By means of this a change in shutter automatically changes the diaphragm to a correctly compensated f stop—a factor that eliminates light meter consultations and mental gymnastics between every shot. For more information about this camera, contact the Ansco News Bureau, 175 Clinton Street, Binghamton, N. Y.

FASTER COLOR FILM

Available now in miniature camera size is Kodak Ektachrome film, rated as approximately three times faster than Kodachrome film. Like Kodachrome, when processed, the new film results in color transparencies suitable for mounting and projection as color slides. In addition, as has been possible with the larger roll and sheet film sizes of Ektachrome heretofore available, the film can be processed by the photographer.

The X indicates the fossil nummulites or coin-stones among the lentils in the picture on page 211.

HIDDEN GIANTS OF THE CHISOS

(Continued from page 180)

to undo the damage of half a century. But when the rains come again to Big Bend, and the seed patches begin to spread grass across the face of the desert, a beginning will have been made. It is possible even to foresee the ultimate recovery of the higher slopes, where the curious weeping juniper and the ubiquitous pinyon pine cling precariously to a wind-scarred land.

The day may well come when visitors to the Big Bend will not sneeze in dust-laden air. Instead, they will travel through lush grasslands sloping upward into carpets of scrub growth, then on into pines and hardwoods that are busy holding the crumbling rock and making it into soil, and eventually up into even higher canyons, among the hidden giants of the Chisos. And the "dust line" will have retreated a full mile to its natural environment, on the banks of the world's dustiest river.

Cypress Forest

Concerned by the fact that there was no good sample of bald cypress forest in public ownership, the Nature Conservancy swung into action when word came that lumbering operations were imminent in the last of the beautiful cypress forest in southwest Florida known as Corkscrew Swamp. In collaboration with the National Audubon Society, it was possible to get a few individuals and foundations to underwrite the sum of $145,000 immediately to halt lumbering. This was done, and now the Nature Conservancy is campaigning for at least $25,000 of this amount. Contributions may be sent to that organization at 4200 22nd Street, N. E., Washington 18, D. C.

High School Conservation

Under the grant to the National Association of Biology Teachers from the American Nature Association a great deal of valuable material was gathered relating to the conservation teaching by biology teachers. This three-year study was organized on a regional and local basis. One of its excellent results is to be found in a bulletin issued by Tom Wiley, Superintendent of Public Instruction of New Mexico. This is entitled "Conservation Projects for the High School", and the material it contains was collected and edited by Howard J. Dittmer, Professor of Biology at the University of New Mexico, and compiled by R. P. Sweeney, Director of Secondary Education of that State. Twenty-five practical projects are described by as many writer-contributors.

Trip to Mexico

Winifred Duncan, author and naturalist, has lived fifteen years in Mexico and has sought out places in that country never reached by the average tourist. She now announces organization of a private trip to Mexico for writers, poets and naturalists. Full information about the character and the cost of this trip may be obtained by writing to Miss Duncan at Box 343, Fairhope, Alabama.

Forest Service Income

Between July 1 and December 31, 1954, the U. S. Forest Service deposited in the Federal Treasury $42,404,302.75 in receipts from the sale of timber, grazing permits, and land and power use fees. This represents an increase of about four and three-quarter million dollars over the same period in 1953.

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WRITING

BOOK MANUSCRIPTS invited—Co-operative publishers since 1925. Meador Press, 324 Newbury St., Boston 15, Mass.

THE PREDATORY VIEW

(Continued from page 201)

bering. The scenes outside the Park are of exactly the same kind of forest—gigantic Sitka spruces and western hemlocks—after "selective cutting" *by Rayonier itself.*

These scenes of desolation do not result from improper lumbering methods. The cutting was done under Forest Service supervision on its land, and with as little destruction as is commercially feasible. The contrast represents the difference between a *national park*, devoted to the preservation and enjoyment of natural beauty, and a *national forest* operated commercially on a sustained-yield basis, with both of them properly managed for widely different purposes.

When lumbering involves the felling, on a commercial basis, of trees five to ten feet in diameter and more than 200 feet in height, all scenic beauty has to be sacrificed. Under the old "high lead" system, such forest giants were dragged out by an overhead cable, tearing out nearly every living thing in their path. Under the deceptive name of "clear cutting," the land was stripped and torn to shreds. Under the modern "selective cutting" system, the same "ripe" trees are handled by caterpillar tractors and trucks. Smaller trees, saplings and undergrowth are still smashed and ripped out and the ground torn up, but enough smaller trees remain standing to produce a new crop of pulp timber after some years, and to reseed the soil.

What is lost under "selective cutting" is exactly what the Olympic National Park was created to preserve for the American people—the beauty and majesty of the Olympic rain forest, which combines gigantic tree growth (even up to 300 feet) with fantastic overhead rooting of trees, carpets and hanging festoons of moss, and the luxuriant undergrowth of these "cool tropics."

There are only two classes of people who contend that commercial lumbering in the Olympic National Park would not ruin the beauty of the forest—those who do not know and those who do not care.

THE MARBLED SALAMANDER

(Continued from page 206)

hatched family and retreats to a hiding place deep within the earth.

The eggs, now alone, are subject to destruction by a number of natural enemies such as beetles, crayfishes, and even other salamanders. Their fate is simply a matter of time and good fortune. . .

. . .Now, once again, the vast Carolina meadows have lost their greenness. Far up in the sky the hawk, weary from long hours of fruitless searching, drifts lazily earthward in an ever-tightening spiral, finally flapping dejectedly back to his perch in the naked tree. Here he fluffs his feathers briskly in an effort to ventilate them against the increasing cold. A whirlpool of dead leaves, borne by an icy wind, dances across the brown sod, splashing at last against the trunk of the ancient oak. The hawk, thoroughly cold now and disgruntled with life, glances apprehensively northward to where a great mass of frosty cumulus is rising slowly upward over the edge of the world.

All the earth seems chilled and lifeless, yet soon myriad tiny tadpoles will spring forth unseen and unheralded out of the cold grasp of winter.

THE MILKY WAY

(Continued from page 213)

increased knowledge of atomic processes indicates that the stars may not be exhausting themselves quite as rapidly as we used to think. It is hard to evaluate how much this could add to the possible age of the Milky Way, and astronomers are somewhat reluctant to commit themselves at this time.

In the month of April, the Moon will be full on April 7, and the New Moon will occur on April 22.

Mercury may still be seen just before sunrise early in the month, but will in general be unfavorable for observation, and will enter the evening sky on April 23.

Venus will rise at approximately 4:00 A.M., and will be at about 15° to 20° above the horizon at sunrise.

Mars will be in Taurus and will be visible in the early part of the night, setting at about 9:30 P.M., on April 15.

Jupiter will be in Gemini, setting at approximately 1:15 A.M., on April 15.

Saturn, in Libra, will rise at about 8:30 P.M., on April 15, and will be visible all night long.

Uranus is not mentioned here ordinarily, because it is too faint to be visible to the naked eye. In April, however, it will reach the 6th magnitude, just beyond the range of unaided vision, and should be easily detected with ordinary binoculars, only a few degrees to the east of Jupiter.

The Lyrid meteor-shower will be seen in the early morning hours on April 20 to 22. It should be quite favorable this year, because these will be moonless nights, and the expected rate for the zenith of Washington, D.C., is eight meteors per hour.

Save Israel Swamp

Word comes from the Brussels headquarters of the International Union for the Protection of Nature that part of a 15,000-year-old swamp land in Israel has been saved from total destruction through the creation of a Nature reserve. This area provides unique examples of primitive and tropical African conditions in a Mediterranean region. One thousand acres have been set aside as a result of the activity of the Nature Protection Society of Israel, established in 1953 with the aid of I.U.P.N. This marshland is located north of the Sea of Galilee, and has retained extraordinary examples of primitive plant and bird life through thousands of years of change in the Mediterranean area. It comprises an island of papyrus growth unique in this part of the world. It is also a stopping place for migratory bird life.

Bird Song Record

In mid-January the Cornell University Press released Volume I of its American Bird Songs recording on a long-playing record, 33 1/3 RPM. On this two-sided record are reproduced the songs of sixty of our most distinctive and familiar birds, their songs recorded in the wild by Drs. Arthur A. Allen and Peter Paul Kellogg of Cornell's Laboratory of Ornithology, and with the help of others in the field. These recordings were first released in 1942 in a 78-RPM album. Improvements in techniques and a larger selection of recordings now make this recent release superior to the original. This new record sells for $7.75, and may be ordered through the American Nature Association.

Isabelle Story Retires

After forty-four years of Government service and association with the National Park Service almost since the day of its establishment, Isabelle F. Story has retired from her post as the Service's editor-in-chief and assistant chief of information. Through the years she has played a most important part in publicizing the National Park system and in enlarging public understanding of its objectives. She was the first woman to become an information officer in a Department of Interior bureau, and she was the first to inaugurate radio programs in the Department. Miss Story enjoys a wide reputation as a writer on conservation and parks, and is a member of the Society of Women Geographers, Women's National Press Club, American Newspaper Women's Club, Outdoor Writers Association of America, American Women in Radio and Television and Theta Sigma Phi.

Mosquitoes

Mosquitoes. By William R. Horsfall. New York. 1955. The Ronald Press Company. 723 pages. $16.00.

Professor Horsfall, of the Department of Entomology of the University of Illinois, subtitles this important work "Their Bionomics and Relation to Disease." Here, of course, is a book for the specialist—the economic entomologist, the epidemiologist, the sanitarian, and others concerned with the sub-family of mosquitoes. His text is arranged according to accepted taxonomic classifications, and assembles within covers vast data of vital importance to research.

Migration Fatalities

Much extremely sad but interesting information on bird mortality during night migrations in October, 1954, is assembled in the December, 1954, issue of *The Migrant*, quarterly journal of the Tennessee Ornithological Society. Weather conditions on the nights of October 5-6,6-7, and 7-8 were such that uncounted thousands of migratory birds, most of them small, were killed around airport ceilometers, in brightly lighted areas, and at radio and television towers. For example, several hundred birds of at least 34 species were killed at the ceilometer at Mitchel Field, Long Island, and more than one thousand birds of at least 50 species perished at the Suffolk County, New York, Air Force Base ceilometer. As the cold front, with its low overcast, moved on, increased casualties resulted. At the Maxwell Air Force Base in Alabama between 18 and 20 thousand individuals of 22 species perished; at Macon, Georgia, an estimated 25,000 birds were killed, and at Savannah a comparable number. Data supplied by James T. Tanner of Knoxville, Amelia R. Laskey of Nashville, Albert F. Ganier of Nashville, Adele H. West of Chattanooga, Robert J. Dunbar of Oak Ridge and Lee R. Herndon of Elizabethtown is assembled in this important report, which constitutes a record of an avian holocaust of major proportions.

Quetico Foundation

A group of leading Canadians has organized the Quetico Foundation, which will be devoted to promotion of the Quetico-Superior area in northwestern Ontario and Minnesota as wilderness recreational land. The Foundation takes the place of the Canadian Quetico-Superior Committee. Harold C. Walker, Toronto lawyer, is chairman, and the vice-chairman is M. S. Fotheringham, president of the Steep Rock Iron Mine in northwestern Ontario. Headquarters are at 696 Yonge St., Toronto.

On January 17 President Eisenhower appointed three members to The Quetico-Superior Committee, first established by Executive Order in 1934. Chairman is Charles S. Kelly of Chicago; executive secretary is Ernest Oberholtzer, and Paul Clement of Minneapolis is the third appointed. Named to the Committee by the Secretary of Agriculture is H. Dean Cochrane, Regional Forester of the Forest Service, and by the Secretary of the Interior, W. G. Guernsey, assistant director of the Bureau of Land Management.

Undersea

The Silent World. By J. Y. Cousteau, with Frederic Dumas. New York. 1955. Pocket Books, Inc. 225 pages. Illustrated in color and black and white. $.35.

Originally published in a trade edition by Harper and Brothers, this story of undersea adventure and discovery is now available in this "Cardinal Edition." It is the strange and fascinating story of wonders beneath the surface of the sea. It makes exciting reading.

Johnny Appleseed

Johnny Appleseed; Man and Myth. By Robert Price. Bloomington, Indiana. 1955. Indiana University Press. 320 pages. Illustrated. $5.00.

A statement made one day in 1930 along Mootz Run in Licking County, Ohio, sent the author of this book on a quarter-century of travel and research to learn the story of Johnny Appleseed. Separating the man John Chapman from the myth that has grown up around him as Johnny Appleseed was a tremendous and fascinating assignment. Dr. Price has performed a remarkable and definitive task and given us a rare biography of a man who "was as thoroughgoing example of good old-fashioned American individualism as ever chopped out a clearing." Following this folk hero through the pages of Dr. Price's book is a delightful adventure, and we recommend it most heartily.

Camp Music

ABCs of Camp Music. By Janet E. Tobitt. Pleasantville, N. Y. 1955. Box 97. 46 pages. Illustrated by Elizabeth Ross. $.75.

Good camping and music go together. In recognition of this, song books for campers have been published and are in use. This book is not such a compilation, but is written to help the uninitiated counselor to use existing material and to get the most out of the music phase of camp life. It is an how-to-do book—how to teach a song, build a repertory, achieve good singing and musical variety, develop leadership. It includes using music for all occasions, for creative play, for folk dances, in connection with Nature, dramatics, handicraft and design. An excellent bibliography is supplied, and, all together, this is a most valuable and practical book that should be widely welcomed in camping circles.

Purple Martin

Being interested in increasing appreciation of the purple martin, Laymond M. Hardy, Box 99, Eaton Park, Fla., will, in a stamped, self-addressed envelope, supplied by the inquirer, send a folder about the martin and a packet of martin gourd seed.

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UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

MORE ISMS, MORE PRISMS

IN THE February issue for this year the way that prisms deal with an incident ray of light was explained and illustrated, with emphasis upon **deviation,** the refraction of light beams so as to bend them. The second effect, that of **dispersion,** was mentioned, and we now have an illustration in black-and-white to make the explanation more graphic. When shown in full color, as is not infrequently the case in advertising displays, such a picture can become striking indeed.

But this is far from being the full story about prisms; in fact we have only begun.

In addition to their uses in refracting and dispersing, prisms may be designed so as to reflect light, like a mirror, but are even superior to a mirror for certain purposes. To understand the **reflecting prism** it is essential to consider mirrors in general and the critical angle in particular.

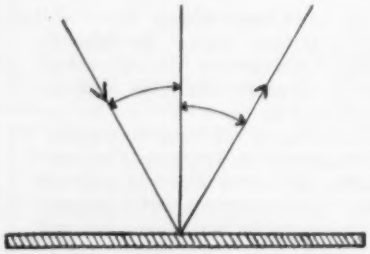
Mirrors

REFLECTIONS from mirrors have always captured the fancy of man. Who among us is not subject to the spell of the quiet forest pool, with its gorgeous duplication of scarlet autumn trees, or of the reflecting pool before the Taj Mahal or the Lincoln Memorial? The most perfect of all mirrors is the still body of water, and Nature supplies these reflectors in abundance. Next in man's historical career came the mirror of burnished metal, termed the *speculum.* An early myth that has seen many variations is that of the Gorgon, Medusa, the sight of whom turned men to stone, and who was slain by Perseus through the subterfuge of looking only at her reflection in his polished shield. The looking-glass came last, but has found widest usage, in that it can be made in any size or shape, portable or stationary, to suit all pocketbooks. Pool, metal, and glass all meet the first requirement, which is that of a perfectly smooth surface, to permit *regular reflection.* There is some absorption and also some diffusion of the incident light with the best of mirrors, but not enough to interfere with the image to an appreciable degree.

In composition, modern mirrors are usually either of speculum metal or plate glass. The metal is a copper-tin alloy, with a little arsenic or other ingredient to whiten. The glass must be flawless and of superior quality and workmanship; most of us have seen the wavy, imperfect reflections from cheap mirrors. For customary uses, glass mirrors are metallized on their rear surfaces, then given opaque backings. The metal employed was formerly a tin amalgam, more recently silver, and most recently aluminum. Actually such a mirror is no more than a speculum covered with a protective glass; the metal and glass mirrors are basically the same thing.

This procedure makes a *second-surface mirror,* the nature of which is further explored by a simple but interesting experiment. Select as thick a mirror as is available, stand or hang it vertically, and place a lighted candle about one foot to one side and slightly in front of this mirror, on any convenient stand, in an otherwise darkened room. Place yourself slightly in front of the mirror on the side opposite the candle and vary your position until that one is found that yields the most numerous and clearest multiple images.

The explanation of why you see the candle more than once is simple and readily understood by anyone who has noticed their own reflection while looking into the display window of a storefront from the street. The law of the mirror is that the angle of reflection equals the angle of incidence (fig. 1). If light rays approach



1. Regular reflection from a plane mirror. Angle of incidence equals angle of reflection.

a mirror at an angle of 45° to the normal (vertical) to the mirror's surface, then they "bounce back," or are reflected at the same angle of 45° on the other side of the normal. When the candle is viewed via the thick mirror in a darkened room, the front or *first surface* of the glass acts as a mirror, just as does the storefront glass. The percentage of the total illumination devoted to this first reflection varies with the angle of obliquity, but let us say, for example, that 12% is reflected away by the front surface. The remaining 88% (discounting here a certain amount that will be absorbed) passes to the back of the mirror glass, meets the silvered surface, and undergoes regular reflection. Of this 88%, only 88% will emerge, since a second increment of 12% will be *internally reflected;* sent back by the front surface to the rear again, and thence to the front once more, where 88% of it will emerge, 12% again sent to the rear, and so on. The regular reflection from the back or second surface of the rays first received will form the brightest image of the candle flame, the front surface image is next, and others follow in decreasing luminosity.

In precise work, especially photography, these duplicating and overlapping images of the light source are apt to cause glare. To prevent these multiple reflections, a *first-surface,* or front-surface, mirror is used. Here the metal film is deposited on the exposed glass or metal surface, and such mirrors must be carefully protected when not in use and cleaned only with a fine, soft brush. We have seen an expensive silvering job ruined by a laboratory assistant who, never having heard of a first-surface mirror, breathed upon a soiled one and wiped it vigorously with a cloth, an excellent procedure with an ordinary mirror but disastrous in this case.

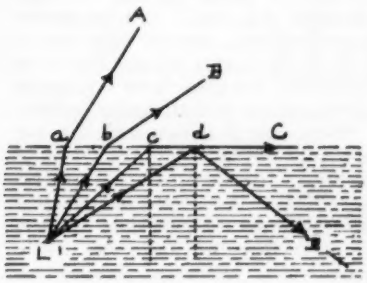
Mirrors are further classified according to shape of reflecting surface, with most of the regular geometrical figures represented. The looking-glass is a plane mirror, auto rear-vision fender mirrors are spherical-convex, shaving mirrors are spherical-concave, and those seen in amusement parks have wavy surfaces that are various combinations of cylindrical or spherical concave or convex portions, to yield fantastic images. Searchlight reflectors and those of auto headlights are paraboloidal.

On top of the primary fact of image formation there is a further cause of wonderment about mirrors; they reverse the image horizontally. The image is not inverted, as is that of a camera or compound microscope; when we gaze at our reflection in either the horizontal pool or the upright pier glass, we are not seen standing on our head. But if we place ourself before a mirror and command "Righthand salute!" and execute the same, the disobedient villain in Looking-Glass House gives us a left hand salute! Or we may hold a piece of printed matter up to the reflector and agree, with *Alice,* that "-it's all in some language I don't know."

What is the explanation for this reversal in one dimension and not in the other? The tip-off will come if you will take a sheet of typewritten material, such as a letter, and hold it in front and slightly to one side of your head as you face a mirror and a light. The bathroom mirror with its shaving light is the proper setup. The typed matter should face the glass. Look *through* the paper from the rear and at the same time observe its reflection. The two agree perfectly; there is no reversal. This makes it clear that if we could get around to look at the *other side* of our reflection—view it from the same point of vantage as does the mirror—there would be no reversal. What we see in a mirror is the *back of our reflection*—the rear face of it, so to speak. To put matters in their true light we ought to be able to go through the mirror, like *Alice,* into Looking-Glass House, turn around, and peek out upon the room we have just left; or be like the lad who greeted his G.I. pal, just returned from an overseas campaign, with "I see you're back from the front!"

Critical Angle

IN OUR earlier discussion of refraction we have noted that an oblique ray of light, passing from air into water, is bent toward the normal, the ratio of the velocities of light in the two media being as 1 to 1.33. In fig. 2 the direction is reversed,



2. The critical angle.

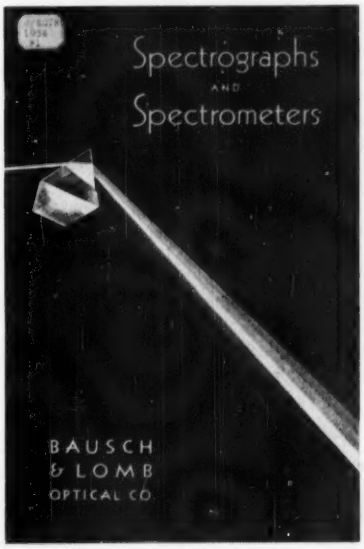
L being a light placed under water, as in an experimental tank. A ray *a* is refracted to position A, the bending now being away from the normal, the ray passing from the denser into the less dense medium. Ray *b* is refracted at a greater angle, to position *B*, and so on. As the obliquity of these emergent rays increases, there comes a ray *c* that is refracted so as to make an angle of 90° with the normal, and consequently lying in the plane of the water surface, to position *C*. No greater refraction is possible, and the angle of the incident ray *c* with the normal is the *critical angle*. It may be defined as that angle of incidence for which the angle of refraction is 90°, and it will vary with the medium containing the incident rays.

3. Deviation by a prism.

If the refractive index of this medium is known, the determination of the critical angle is simple, following the sine law of refraction. This states that the ratio between the two media is equal to the ratio between the two angles—thus, the refractive index of air over the refractive index of water equals the sine of the angle of incidence over the sine of the angle of refraction. In the case before us, three of these quantities are known, hence solving for the fourth is easy. The refractive index of air is 1, of water, 1.33. The angle of refraction here is 90°, the sine of which is 1. So we have 1 over 1.33 is equal to sine i over 1, or the angle of incidence, which is the critical angle sought, is 49°. From this the general formula is derived, sine *c* equals 1 over *n* (refractive index of medium containing the incident rays). For flint glass this angle is 36°, for crown glass it is 42° and for diamond 24°, where air is the other medium.

Total Internal Reflection

REFERRING again to figure 2, what will happen when the angle of incidence is increased beyond the critical



4. Dispersion by a prism.

angle of 49°? Ray number four reaches the water surface at *d* but is unable to emerge; instead it is *totally reflected* back into the water to D. This occurs whenever the angle of incidence exceeds the critical angle and when light is passing from a denser into a less dense medium.

A result of this law is that an eye placed at *L*, under water and looking upward, sees the entire panorama of the heavens, from one horizon to the other, compressed within a cone whose diameter at the surface is 2*c*, or 98° instead of the 180° it would be for an eye in air. In order to show people what a fish sees of the aerial world above, Robert Wood constructed a "fish-eye camera" and took a number of highly interesting photographs. As expected, all objects showed a great amount of distortion.

Several simple experiments will demonstrate total internal reflection; likewise there are a number of modern devices that depend on this property. Hold a glass full of water at about half arm's length in front and somewhat above the level of your head. Look at the water surface from the under side and note that it

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resembles quicksilver and is a perfect mirror. Hold the other hand at full arm's length, fingers spread slightly, positioned vertically, beyond and behind the glass, at about the same level. You can now see your fingers twice, once by refracted vision through the lower part of the glass and water, and again by reflected vision in the mirror of the under surface of the water.

Place a sheet of white paper on a table and on this a beaker or plain glass full of water. Now hold an empty testtube in the beaker at approximately a 45° angle and view it from above. The tube seems to be filled with mercury. Light passing from the white paper into the water cannot enter the air of the testtube, the angle being greater than critical, and so is totally reflected. Slowly fill the tube with water and observe the disappearance of this shining reflection. The case is similar to that many people have seen when a diving beetle, a common insect of our ponds, carries small bubbles of air with it when submerging, to provide for breathing under water; these bubbles seem to us like droplets of quicksilver. The bright reflection is that of the sky.

An illusion based on this principle is sometimes seen in advertising gadgets in shop windows, to attract attention and create wonderment. A stream of water flows from a tank and is pumped back through a concealed return. Behind the issuing waterfall is a focused beam of light, which follows the stream, reflected internally back and forth many times, escaping here and there so as to be seen and give the whole column of water a self-luminous appearance. Rods of glass, quartz, or plastic may be bent so as to "carry light around a corner" by repeated internal reflections, the incident light applied at one end. Such a means of delivering a "cold light" to interior parts of the body is now widely adopted in diagnosis, as the light used to transilluminate the sinuses, and in therapy as ultraviolet directed to hidden infected parts via a curved quartz rod. Supply houses now provide a coiled lucite rod mounted on a base containing a lamp, for demonstration of this amazing phenomenon of total internal reflection.

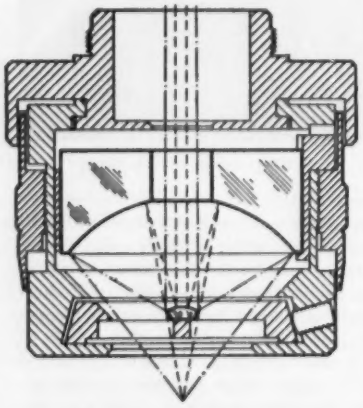
The diamond, with a high refractive index of 2.42 and the low critical angle of only 24° is thereby the most lustrous of gems, for the diamond-cutter so shapes the stone that rays entering any of the upper surfaces are trapped, undergoing several internal reflections before emerging again at the upper surface, thus shining with great brilliance.

Regular readers of this Department will recall that we have been running a series on *Meteorological Optics* and another on *Optical Illusions*. Important examples from both of these fields depend upon internal reflection and Ye Constant Reader will now see the light as to the whys and wherefores of our scheme in bringing in this new matter. The experiment just cited, of viewing the fingers twice with the glass of water is a first-class optical illusion, and the next topic to come up in meteorology is the rainbow, Nature's gigantic demonstration of the critical angle and total internal reflection, as well as of dispersion. We shall discuss these subjects and also take up that most important optical instrument, the reflecting prism, in imminent installments.

REFLECTING OBJECTIVES

DURING the latter part of the 17th and first of the 18th centuries there was considerable competition between those advocating mirrors and those preferring lenses as the means of producing magnified images for both microscopes and telescopes. In the century that followed, mirrors won out for use with the larger, astronomical telescopes, but lenses took over completely for microscopes. Recently there has been a revival of interest in the possibilities of reflecting microscopes, and a model of Dutch manufacture was put on the market for a while, but seems to have been withdrawn.

Now we are seeing some reflecting objectives issued by different firms. The one here illustrated is made by Beck, of London, and produced in conjunction with the Wheatstone Laboratory and Medical Research Council Biophysics Research Unit at King's College. Each of the several powers available are fitted with the standard Society screw and are thus attachable to any regular microscope stand.



As can be observed in the accompanying drawing, rays of light from the specimen are reflected by a concave mirror (the primary speculum) of such shape as to bring all rays to a focus upon a small central convex mirror (the secondary speculum) located nearer the specimen than the first mirror. Thence the rays are reflected up the tube, passing through an aperture in the first mirror, the design being that of the Cassegrainian reflecting telescope.

Chief advantage of the reflecting over refracting objectives lies in the absence of chromatic aberration. As explained in our current series on prisms, when light passes obliquely from a medium of one density into another medium of differing density, as from air into glass, it suffers deviation, or change in direction. But in the glass the waves of different lengths are refracted to different degrees, and thus white light is dispersed or fanned out into the colors of the spectrum. Many and costly are the steps necessary to overcome as much as possible of this chromatic aberration with lenses. In a first-surface mirror, however, since the light rays do not traverse the glass or metal, there is no dispersion. The mirror is the only optical instrument free from this major problem.

There must be correction for spherical aberration in this, as in other types of magnifiers, and these new objectives are stated to be well corrected and to have a particularly flat field. Working distances on the dry objectives are greater than in corresponding refractors. Another advantage for the new objectives is that they reflect ultraviolet rays. Ordinary glass is opaque to ultraviolet and the lenses of microscopes designed for work with this important illuminant must be made of quartz and are very expensive. Because of the much shorter wavelengths of these rays, finer detail of the specimen is resolved and the image, invisible to the eye, is captured photographically.

Prices range from $250 for the 13 mm objective to $350 for the 1.7 mm immersion glass. For further information write the American representatives, C. A. Brinkmann & Co., importers of many lines of scientific apparatus for educational and industrial uses, 378-380 Great Neck Road, Great Neck, L. I., N. Y.

B & L HAS NEW PRESIDENT

IN THE 101-year history of the Bausch & Lomb Optical Company, there have been just five presidents. Elected to succeed J. F. Taylor, who becomes chairman of the board, is Carl S. Hallauer. The new president's career is in the best American tradition. He was orphaned at the age of nine and began his business career at that time as a newsboy. At sixteen he went to work for Eastman Kodak, and shortly became head of their recreation association—one of the first such things in American industry.

Hallauer joined B & L in 1918 as director of industrial relations. His amazing vitality and knack for getting things done led to his promotion to head of production and maintenance, and then in 1935 he was made vice-president in charge of sales, industrial relations, and purchasing.

EMBRYO'S TOAST

Drink to me with thine optic cup,
  And I will pledge with mine;
Thy Rathke's pocket filled shall be
  With amnionic wine.
With aqueous humor fill 'er up,
  And if with me thou'lt dine,
We'll drink a toast in Orange G
  Or Eau de Haidenhain.

—Ben Johnson, To Celia.

a Quiz that may save your life

Q. What is cancer?

A. An uncontrolled growth of cells. If permitted to spread through the body, it inevitably leads to death.

Q. Can cancer be cured?

A. Many types can be cured, but only if they are discovered and treated early.

Q. How can cancer be discovered in time?

A. By your doctor who has available many diagnostic tests.

Q. What is the American Cancer Society?

A. The only national voluntary agency which fights cancer by research, education and service to cancer's victims.

Q. What has it accomplished?

A. It helped save an American from dying of cancer on an average of every seven minutes last year.

Q. Does that mean it has solved the cancer problem?

A. Unfortunately, no. Despite the advances made, more than 235,000 Americans will die of cancer this year.

Q. Can I help to prevent this tragedy?

A. Yes. By having regular health examinations yourself. And by contributing to the American Cancer Society.

Q. What will my contribution be used for?

A. For research that may some day save your life, for education and for helping cancer's victims.

Strike back at cancer... man's cruelest enemy... Give

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She was Nellie Bly, reporter for the New York World. And she was in a big hurry to reach Jersey City and beat a fictional man in a trip around the globe. The man's name was Phileas Fogg, phlegmatic English hero of a popular novel by M. Jules Verne: *Around The World In 80 Days.*

And beat him she did—in just over 72 days—with only one dangerous incident. A "titled cad" tried to flirt with her in the middle of the Indian Ocean, but even he subsided when she threatened to signal the nearest U. S. man-of-war.

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